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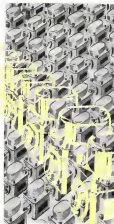
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Swinging Around the Circuit

Washington continues to buzz as summer waxes with action of major import to aviation. Ned McElroy, the Congress's very magnetic nonmember to succeed Charles E. Wilson as Secretary of Defense, is best known to date for his sponsorship of the radio and television "beer spots." In his new Pentagon post he will get a chance to write the script for a new chapter in the aviation serial that has been unfolding since the end of World War II.

Unification of the military services and elimination of duplicate weapon development will be one of the major issues at the next session of Congress. Congressional leaders, such as Rep. George H. Mahon (D-Tex.), chairman of the Military Subcommittee of the House Appropriations Committee, are making it crystal clear that Congress and the taxpayers are no longer willing to "equal all the services to fight the whole war by themselves." But in military procurement expenditures that helped cause the federal debt level crisis is due almost entirely to triplication in the munition program where USAF, Army and Navy are all developing a complete arsenal of missiles for every military job from a few miles to intercontinental range. Congress is also losing its taste for supporting obsolescent elements of the military structure.

Realistic Evaluation

Watch for increasing emphasis on realistic weapon system evaluations before new weapons are committed to multi-million dollar production programs. Congress is also becoming aware that many new weapons systems hastily rushed into production are of dubious military value and were really suggested only to bolster the position of an individual service. So far Weapons System Evaluation Group in Pentagon has had little influence.

Some kind of realistic weapon system appraisal is clearly necessary to launch our inferior and duplicating weapons production programs. Good example of swing that could be accomplished is the type of realistic evaluation at the Ames multi-billion dollar Nike Ajax program which is designed to operate against World War II type bombers but was essential to bolster the Army's political position in the missile race.

Civil Aeronautics Board needs to be in the right direction by exercising its legal authority for aircraft control and integrating this responsibility to the Civil Aeronautics Administration. This action follows the principle recommended by Edward Costa, former special nation adviser to President Eisenhower. Of course the Panel of Air Conditioning Committee proved totally inadequate to cope with growing conflicts of airspace use between military and civil aviation.

CAB's move to deny major airlines a 6% fare increase is prompting not so much because of the decision but because of the swift counteraction paid the airlines case presented in favor of the raise.

Airline fare levels are certainly the major issue facing the air transport industry today and also have a vital bearing on the health of the aircraft manufacturing business.

Airline Effort Needed

If the airlines are to get a reasonable adjustment of their fare structure they must make a far more intense effort than they did in the recent case. This effort must be aimed at the traveling and shipping public as well as at CAB and its staff. In considering the general fare readjustment CAB should place more emphasis on the dynamic growth requirements and economic necessities of a modern air transport system rather than on applying a narrow public utility type of rate of return viewpoint.

Never before have government-industry relations been so important for the future of aviation. We are in the midst of a period of dramatic change where reliance on past performance and patterns is no longer sufficient to plot the program for the future.

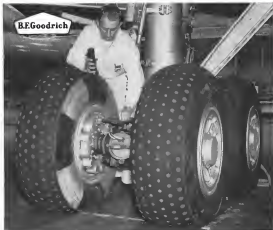
In the atmosphere we sense a reluctance on the part of industry leaders both in manufacturing and air transport to come to grips with the government leaders charged with providing defense and regulating transport. It is no longer sufficient to grope in the security of corporate headquarters and have lobbyists to carry the ball in Washington.

Leadership Demands

Many of the great pioneers who built the aviation industry are still actively directing their industrial enterprises. Many capable younger leaders are also rising in the industry. These public reputations and technical experience environments qualify them as spokesmen for aviation before both public and government. Yet there appears to be a growing reluctance to discharge their responsibilities. Aviation leaders tend to appear in Washington only when summoned by a Congressional committee giving nonentities to be placed in special case before a regulatory agency.

Aviation needs vigorous, experienced spokesmen to present its case for what it can contribute to the future growth of the country. This is a case that needs to be presented to both the public that will benefit and to the government that must of necessity regulate its activities.

—Robert Hertz



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Ralph R. Hurd, vice president and general manager, IRL (Canada) Ltd., Concord, Ontario, Canada.

Dr. Theodor C. Fu, vice president and director, Unesco Engineering Research Group Division, Space Research Corp., Santa Fe, Conn.

Arthur H. Jones, vice president-director planning, Aero Manufacturing Corp., New York, N. Y.

Dr. J. William Thompson, vice director (London, England), Northrup Airlines Inc.

Frank Malver, director, Jetstream Research Products Office, Air Traffic Control, Los Angeles, California, U.S. Air Force, Washington, D. C.

Howard C. Rugg, director of government relations, Washington, D. C., office, Collins Radio Co., Cedar Rapids, Iowa.

Dr. Felix A. Kohn, assistant to the president for long-range planning, Verical Aircraft Corp., Marietta, Ga.

Honors and Elections

The Air Force has for the first time presented special plaques to individuals of the Air National Guard in recognition of their contributions to aerospace during the year. The recipients were: Maj. Gen. William F. McKee, Vice Commander of AWC Gordon H. Tyler, Deputy Director of Personnel and Production, Boeing-Vertol, Inc.; Col. Joseph D. Fitzgerald, Director of Supply and Services, United States Air Force; and Col. Philip G. Noddy, Director of Quality Control, Rockwell, Inc., Santa Monica, Calif.

Dr. P. J. Jones of the Honeywell Corp. has been awarded the 1964 National Aeronautics Award for his work in the development of the first supersonic jet engine. The award was presented to him by the National Aeronautics Association at its annual meeting in New York City.

Changes

Richard E. Stockwell, management in aeronautics, has been named as the new director of the Air Force Research Office, Dayton, Ohio.

Dr. Robert A. Stockwell, director of the Air Force Research Office, Dayton, Ohio, has been named as the new director of the Air Force Research Office, Dayton, Ohio.

James S. Winkler, vice president, has been named as the new vice president of the Air Force Research Office, Dayton, Ohio.

Charles C. Winkler, vice president, has been named as the new vice president of the Air Force Research Office, Dayton, Ohio.

Robert C. McNeil, chief engineer, has been named as the new chief engineer of the Air Force Research Office, Dayton, Ohio.

(Continued on page 112)

INDUSTRY OBSERVER

North American Aviation's Rocketdyne Division is doing research and development on nuclear-powered rocket engine.

General Electric has completed a 1,112 mph. aircraft engine's speed record held by British's Puma Delta F12 fighter type model research plane.

Bell Aircraft Corp.'s AN/SPN-16 Automatic Carrier Landing System (ACLS) has been put in testing on the USS Intrepid (CV-19). Evaluation will be without dual (D) or wave-off capability, but in conjunction with Airborne's wave-off system.

North American Aviation Inc. probably will get work from USAF for development of an advanced strategic missile to be carried by the B-52 for at least 10 years, with no refueling. Some 10 firms were in original USAF competition, with Bell Aircraft Corp. and General Electric among North American's chief competitors. New missile would be much larger, longer range vehicle to perform for the B-52 the function now performed by the B-47 in the Bell B-52.

Development of the missile version of the General B-52 will be temporarily abandoned. Missile pod powered by a Bell three-thrust nuclear engine was considered too short in range for Strategic Air Command requirements, which now demand an air-to-ground missile range of several hundred miles to counter ground-to-air missile defense.

General Electric has been doing work on a new 110,000 hp. aircraft engine. Plans also appear to have slightly modified aircraft tail with increased loading edge sweep and altered forebody area at the exhaust.

General Electric Rocket Co.'s Arrow II rocket motor has achieved Mach 7 in two tests on USAF hypersonic test vehicle. Considered in all the tests, they are used for the Arrow II development by Columbia Institute of Technology's Jet Propulsion Laboratory. Arrow II motor power third and fourth stages of USAF's Project X-45 before launch rocket.

North American Aviation's proposed nuclear-powered aircraft engine will be so far from the 800 hp. required to operate plane launching aircraft that an independent power source will be required. Rocketdyne Division, Inc., is developing an internal combustion engine powerplant, which can run on gas, oil, jet fuel and water to power the aircraft. New engine is being developed.

North American Aviation's Arrow II rocket motor is scheduled for early construction at Douglas Aircraft Corp.'s Ft. Worth Division. Rocket motor already in operation.

There is now problem at Air Force Research Office's Langston, Calif., laboratory as the firm has been in two days of ability to compete to do some of its own programming.

Development now has much improvement in efficiency is offered by turbo fans, plus severe logistics problems of these fans and engine of engine development projects, could keep USAF's chemical engine from being developed. Some observers believe engine will be left out of development addition to the current fans to boost efficiency, without entirely changing fans themselves.

Development now has 1,500 mph. air-to-air missile Arrow II will be produced will be received later this year in part of new strategic missile. General Electric is giving defense program. Arrow is slated to be test flown in December. Development is reported to be coming along 5,700 hp. engine. If Arrow, powered by General Electric engine (AW July 29, p. 26), is not built, North American Air Force might use U-2 developed missile instead.

Services to Get Fiscal 1959 Ceilings

Wilson exercises requirements secondary to dollar, says "penalty for saving isn't as great this year."

By Claude White

Washington—Charles E. Wilson, defense secretary, has divided 1959 "paper budget" of \$30 billion, inter-service allocations and more will tell Army, Navy and Air Force how much they can plan on spending in the next stringing out July 1.

Wilson's allocations that indicate requirements are secondary to Treasury Department considerations both on fiscal and on ceilings have been agreed for months and should a stop coming on his department's continued before House Appropriations hearings. The change, he admitted, came because "we think the penalty for saving money isn't as great this year as it was in the past."

Fiscal 1958 Plan Due

Actually, Wilson said, the maximum ceiling is facing further cuts on the Defense Department—Navy increased authorization of 63 ships, but Air Force to have four planes for fiscal 1958 stretched nearly to maximum limit at two at three weeks.

A USAF spokesman told Aviation Week he believes the bulk of Air Force cutbacks already have been discussed with other recommendations that the F-101B, F-105, F-24 and F-36 late down production schedules. A new and final program to meet USAF's constant effort, which is designed to show the rate of current spending, was sent to Wilson's desk last Thursday.

Once it is approved, USAF expects cutbacks will start getting paid for in a substantial amount of work already billed for the first quarter of fiscal 1958. Payment has been held up by Wilson's early pending approval of the final USAF program. These cutbacks that a few weeks ago were being forced to become more because of the delay in Pentagon pay means both for the rest and for overruns during fiscal 1958. Wilson blamed the situation on cutting \$2 billion off the fiscal 1958 ceiling as well as the new, higher (but not taking of \$35 billion on fiscal 1958) expenditures on Congressional authorization that the Treasury denied economy.

The committee was reported by Rep. George H. Mahon (R-Tex.) chairman of the Defense Subcommittee of the House Appropriations Committee.

Mahon told the 21st annual convention of the Air Force Association

that neither Congress nor the administration will tolerate an increase in the \$15 billion spending rate, and said a ceiling will be imposed "in fact," he said, "but in what we have done."

Mahon further made a clear depth Wilson's firm stand against further air expansion of the armed forces, that he was strong on Capitol Hill for a radical change.

More Utilization Urged

A degree of utilization never before achieved in peace time is now demanded. Mahon said. The time has come to look down the empty line. Carriers which operate the aircraft."

He blamed the missile program for a good deal of the confusion and confusion. "A few days later, after an acknowledged public statement of his, he conducted feasibility studies on our side with range greater than 300 miles."

Added to that had secured the Army's side of having an 800-mile missile. Secretary Wilson told a reporter such an idea "it about the Joint Staff, via London, 98 and 81/1075 out."

In his endorsement of further air expansion, Mahon looked rather sternly at both AFA and Air Force. D. White was USAF Chief of Staff.

AFA had conducted a single session on its statement of policy at the 1958 convention. It is in address to the service's Secretary White, acknowledged that USAF must continue to be the general pressing down of expenses and indicated that the Tactical Air Command, at least out, will suffer further reductions.

This General White continued.

The defense forces have more rigorous self-examination by do and have still more in the future, get as we do I cannot be with order that in overall adjustment in the present era, equivalent to the Air Force department, has been made. "In fact, this adjustment should take place."

Part of the self-examination, it was indicated, will include a more positive evaluation of weapon systems, noting the actual status, feasibility of Naval aviation.

AFA called on Congress to set up a commission to conduct "objective evaluation" of defense (AW Aug. 5 p. 11). Rep. Mahon added strength to the proposal by endorsing Defense Department's existing Weapons Systems Evaluation Group. He said the group has been given more than 100 little impact on important decisions.

Mahon urged WSTC to challenge the concept of budget management of sales and missions and the employment of specific weapons systems.

Gen. White was specific in listing the problems needing examination, evaluation and involving action to take the military establishment to the next of the present and the future. "Some of these involve the inter-service nature that have dominated National thinking and impeded progress for the past few years."

USAF's Chief of Staff listed these:

- Ballistic missile vs. manned bombers
- Ball defense vs. area defense
- Counter aviation vs. land-based aviation
- Ready reserve forces vs. mobilization reserve forces

Altitude of 90 Miles Simulated

Washington—Man has reached a constant altitude of 90 miles in a high vacuum chamber designed by John H. Blevins, Jr. of the U.S. Navy. The chamber was used to simulate the conditions of a manned aircraft at 90 miles altitude (AW Aug. 24 p. 24).

Features of the chamber project was first described in Aviation Week last Oct. 22 (p. 31).

New record was set in a test run last July 31. Ultimate goal of the Altitude project sponsored by the Air Force Office of Scientific Research is to simulate an altitude of 160 miles.

Subject in the chamber during the 160-mile altitude run was fitted with special suit, set a flight helmet, specifically designed for the project. Oxygen and pressure were piped into the garment from outside the chamber.

Twelve men have experienced in scaling the chamber, a critical problem involving high vacuum conditions avoided.

One major objective of the program is to study the way materials used under low pressure found at the high altitudes would behave. Further, the chamber, by its use, is believed to be considerably different in high altitude than at sea level and for information could be extremely valuable for future developments.

- Adequate compensation for computer personnel
- Realistic military assistance programs

These additions to computerized calculations a continuing deliberation in part for adoption of the Conference Committee recommendations that would award military personnel for their contributions instead of their length of time in the service. Among the recommendations USAF's Strategic Air Command demonstrated that SAC alone could effect savings of \$2.4 billion a year if the Conference program was carried out. It has been authorized by the administration as "voluntary."

Beyond all the discussions about the defense budget last week there appeared to be increasing interest over House lower administration committee progress. Strongest challenge came from congressman Elton Jensen, who told AFA the rising tide of defense and higher cost of financing will more than offset what can be saved by Defense Department economies.

Jensen and the administration's major cost is having of defense to meet requirements instead of to military requirements. He said these may be an improvement as they are with the approach of Robert A. Adams to succeed George Humphrey as Secretary of the Treasury.

"At the moment," Jensen said, "U.S. defense and U.S. military pol are not of any with each other. It takes approximately eight years, for example, to get a modern air weapon off the drawing boards and into the air."

In contrast, the basic premise on which our military policy is based is the assumption that it will change with every economic peril of war. It is precisely this kind of constant change that is responsible for both the drop and the cost inflation to which our defense program is now being subjected."

Jensen said the urgent picture on the Defense Department is financial and not the army requirement, a message admitted by Secretary White.

"The cost of maintaining long term defense requirements during our short term money squeeze will more than offset any savings realized achieved by better administration," Jensen said. "The more quickly and can reasonably we are able to act respectively, the less our defense program will cost."

It was pointed out by Jensen and other observers that under Humphrey and recent Federal Reserve policies, the cost of Treasury financing has increased sharply. Short term loans are most popular, but they are not the most economical for financing what should be long term defense planning, observers said.



Yak-25 Carries Big Radome

First ground picture of the Yak-25 (NATO code: Flashlight) at weather interception to come from Russia show details of the large radome and intake and intake type leading gear. Large diameter of the nose radome indicates search and tracking radar with extremely wide angle coverage and longer range than U.S. night fighters of similar vintage. Swept-back wings indicate two thrusts outlined of the engine nacelles in present appearance. Two Yak-25s ground picture a characteristic of swept-back design of the nose gear. Cockpit houses pilot and radar operator. Main landing gear struts into fuselage bays with wings struts extending into wing leading edges. Also type navigation antenna in visible form on vertical tail fin. Yak-25 has been operational in Red Air Force for about two years and was first Soviet night fighter to carry infrared search, tracking and the one tail radar. Former version with pointed radome was known as 1956 Yakovlev Air Show.





Ejection From B-58 Tested

Rocket test rig of rocket propelled ejection seat from that station of seating of Convair B-58 Hustler bomber. Testing, at release, carried out at Superior Naval Ordnance Research Trials, Chase Lake, Calif., is to study problems presented by possible ejection seats of a three-man crew.

outlined some features of the X-11 Variant, including the fact it has a 15 day lifetime of the pilot seat in various test from vertical to horizontal flight. The plane uses reaction controls for vertical flight, conventional elevons of delta configuration in horizontal flight.

Citing the similar potential of the jet-suit which leads to ground equipment, the paper noted that the power required for the VTOL capability also gave the plane excellent climb and high speed capabilities.

Brown left the work with its initial edition ending in the belief that all "dead weight" possible should remain on the ground.

Brown has made a study of multiple power jets for a full-time VTOL fighter. Multiple jets would be of low weight high thrust type and all units mounted for vertical flight. These jets of their sort down to return to rest through zero drag condition for cruise, which demands much less power than vertical takeoff. Life paratroopers could be brought into play for combat maneuvering, emergency egress, etc. One jet would be used in fuel would be worth eight, company jets.

Concerning the X-14, the Bell paper, prepared by C. D. Rao and J. J. O'Neil, said certain advantages accrue to the horizontal attack plane during critical takeoff and landing, when crew escape in case of engine failure are marginal. The plane, even with its reduced or completely lost power, will use glide to easily in conventional manner. In addition, this philosophy makes the plane extremely viable in a VTOL vehicle, with rolling takeoff possible in a critical condition.

Problem of reconnaissance, all that it requires which is surface back view, can be solved through intake camera, can be engine thrust back.

On the question of whether a better type of engine can be developed for this type aircraft, the paper said the pattern in the gas has been that when a vehicle appears with a new approach, paratroopers, to approach the approach from below.

Project Far Side May Be Expanded

Washington—Several plans now being considered for Project Far Side which would extend target altitude distances beyond the 4,000-m figure for phase one (AW July 22, p. 25, Aug. 5, p. 35).

Some equipment for phase one being already has left for Fort Belvoir, Mo. Observers and supervisors of the firing, scheduled to begin Sept. 15, will be looking for the third firing, also along with some other of the equipment. Transistor transistors to fire the rocket a day for six successive days.

Rocket contemplated for phase two would be a three-stage unit composed of rocket motors used to overcome its own weight, resistance development costs. This would be considerably heavier than those used in the first stage, phase one Far Side rocket, and would be ground-launched, even so, believe could support their weight and that of the associated launching only. Phase one rockets will be launched from a balloon at about 100,000 ft.

Aeromarine Systems, Inc., a Ford Motor Co. subsidiary, is joint contractor for Project Far Side, contracted under requirements of Air Force Office of Special Research.

ASR is supplementing the \$710,000 contract figure by winning approximately \$300,000 of its own money, in showing the importance it places on this

project as a program in the missile field. One of the project is to gather data on unusual phenomena for use in space and in the groundwork for future space exploration.

North American Aviation, Inc., which showed an interest in the project when it was originally advanced by AFOSR, was willing to conduct a preliminary study on its own, but was not willing to invest its own funds in the research. American West has learned that NAA thought a 1,000-oz. altitude was a more feasible goal than the 4,000-oz. consumption.

Pan American Names Public Relations Head

H. B. "Mac" Miller will join Pan American World Airways as director of public relations succeeding John Corbett, who recently resigned to run a management consulting firm. Miller was selected was advanced on the U. S. News and headed News public relations during the closing years of World War II. The closing years of World War II. He joined several military posts with Trans World Airlines where he was director of public relations and a similar post with the American Petroleum Institute.

Lockheed Will Close Plant at Bakersfield

Burbank-Lockheed Aircraft Corp. will close its body assembly plant at Bakersfield, Calif., before the end of the year and transfer remaining work to Burbank and Marysville, Calif., plants.

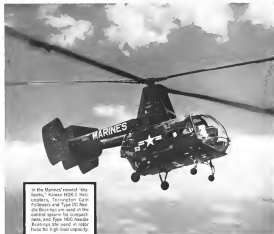
Bakersfield plant, now employing about 500, is working on subassemblies for 16A4 Starliner Super Constellation transports, and making various of Super Constables, including other planes.



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In the Marines' newest "sky hook," Korean HO4S helicopters, Torrington Cam Followers and Type DC Needle Bearings are used in the control systems for compact landing gear, and Type HBC Needle Bearings are used in rotor hubs for high load capacity.



Helping put the lift in "skyhook"

In helicopter, lower weight means greater load lifting ability. Korean Aircraft Corporation achieves this with extensive use of Torrington Needle Bearings in HO4S Helicopters.

The new Needle Bearing Cam Followers and 22 Type DC Needle Bearings in the control system provide high capacity in minimum space. They also allow for the compactness and light weight of other adjacent components. Six HBC Needle Bearings provide high load capacity in the landing gear and the rotor pins where dependable anti-friction operation is essential. Their high capacity bearings support the helicopter.

Torrington Needle Bearings have found extensive use in modern aircraft where maximum weight and maximum capacity are so vital. Torrington offers engineering assistance based on its extensive experience with aircraft applications to help you improve the performance and reliability of your equipment. The Torrington Company, Torrington, Conn.—and South Bend 21, Ind.

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FOUR-BLADED propellers, similar in appearance to those of Lockheed Martin transports, are used in the new C-130B Hercules.

C-130B to Have More Range, Payload

Monetta, Ga.—An improved Hercules transport—the C-130B—is signed to provide greater payload and range—will replace the earlier USAF model now at the Georgia Defense plant of Lockheed Aircraft Corp.

New version of the cargo and troop carrier will have the more powerful Allison T55 A-7 engine, higher takeoff weight, additional fuel tanks, stronger landing gear and four-bladed propellers.

Noise Level

Shift from a three-bladed propeller along with increased engine-to-gear ratio is expected to reduce the noise level inside the aircraft. The changes have made it possible to increase clear area of the prop from the fuselage and reduce the tip speed.

Best quarter have been provided on the flight deck, to prevent use of a relief crew on long range flights.

Both landing gear and the aircraft structure have been beefed up to take care of a maximum weight of 115,000 lb., up from 124,000 in the C-130A. Range increase will result from addition of an extra 1,800 gallons of fuel with tanks in the wings.

Wing span, height and overall length of the C-130B was the same as in the earlier model, but delivered to USAF last December (AVF Dec. 3, p. 90).

Smaller Propeller

In addition to the engine change, diameter of the propeller has been reduced from 15 ft. to 13 ft. Difference between the new landing gear and nose wheel has been increased a few inches. Cocking windows have been eliminated and new window added on the side of the aircraft.

Successful tests have been completed on the six versions of the C-130 and new contracts in testing a five-ton in an eight attaching turbine for Marine jet fighters.

Four-bladed propellers are manufactured by Aeroquip.



SHADED AREAS in drawing indicate changes in C-130B: more powerful engine, additional fuel tanks. Right click and quarter stronger landing gear. Cargo capacity of USAF airplanes being loaded below, will be increased.



Emergency Fare Increase Plea Denied

Raise in passenger rates now called unjustified; airlines criticize Board's action as too quick.

By Paul Karmann

Washington—Domestic trunk airlines bid for a 6% passenger fare increase was voted down by the Civil Aeronautics Board by a 3-2 vote last week. Airlines had sought the increase as an emergency relief measure pending enactment of the General Passenger Fare Legislation.

The Board's action was announced through a press release and did not constitute an official decision, which will be entered and recast at a later date, the CAB said. An airline spokesman said this procedure probably would delay the filing of appeals until the official decision has been issued.

In bringing down the increase, the CAB said that on the basis of the record before it, the requested emergency relief is not justified. The Board added that the General Passenger Fare Legislation, watermarked by the au-

thorities, would be examined promptly and directed that the case be processed on an expedited basis.

In the General Passenger Fare Investigation Case, the Board will consider the entire domestic baseline fare level. Initial exhibits already have been exchanged and hearings will be held by late in summer this fall. It is anticipated the case will reach the Board for decision sometime next year.

Airlines in Case

The 16 emergency increase was requested last March by Boeing, Capital, Delta, Eastern, Northwest, United and Trans World Airlines. American Airlines also applied for the increase late last month. Following hearings, all requests were held before the Board July 11 and Aug. 1.

Opposition to the Board's draft of the increase was made by Vice Chairman Chris Gurney.

"I thoroughly believe the requested increase of 6% in present rates falls in emergency under the Board's responsibility to develop, maintain and keep a healthy level on transport industry, not only to meet the ever increasing needs of the traveling public and its market, but also to make it a vital element of national defense," Gurney said.

Increased operating costs, lowering margins for legitimate return on investment make it impossible for the airlines to compete with other important industries for necessary capital to complete its expansion program, totaling in excess of two billion dollars, Gurney added.

The minutes drafted by this draft of the small 6% increase puts United States civil aviation in a critical financial position. The majority has said, in my opinion, not its responsibility to meet the overall need is a request that airlines may be considered by the industry, some parts of which may be damaged beyond repair because of further delay in meeting the emergency problem laid on," Airbus expressed better disposition

what is the Board's decision. One spokesman said the Board had taken "the case was not" to, having down the increase. Some opposition to the increase had been expressed in Congress earlier and airlines had their fare, but some feeling as the Board's decision.

Airlines also charged that the Board might not have made a thorough study of the issue as the case before taking the vote. One representative was concluded Aug. 1 and the decision announced Aug. 6 with a week and to be taken they pointed out. "It is hard to see how the Board could possibly study the voluminous record thoroughly within that time," one spokesman said.

If the Board turned down the increase much to meet the need in the present emergency, airlines said, then the decision was ill advised because it will paralyze the general fare case.

The relief case in the emergency proceedings was based on sharp downward profits caused by costs rising at a greater rate than revenue, and lower load factors (AW Aug. 5, p. 35).

Donald W. Nyrop, Northwest Airlines president, explained it this way: "The reason for the industry's declining profit margin lies in the fact that the price we may charge for our product is strictly regulated, while our costs of

doing business, wages, parts, fuel and even the landing fees and other charges soared. For the rest of the nation's imports, are not regulated and are increasing, year by year at an astronomical rate in month."

Rising Costs Cited

C. R. Smith, American Airlines president, said that airline fares are at an approximately the same level at 1942-17 years ago. This has been held at that level, he said, because the airlines have absorbed the cost increases brought about by inflation and other costs. Yet the product itself is far superior in safety, comfort, service and dependability.

Smith also said that while airline fares have remained about level the Consumer Price Index has increased more than 60%, and fares about 40% and less than 25%.

In arguing for the increase before the CAB, airlines pointed to operating results for the first half of 1957.

Eastern Airlines, for example, reported an increase in operating costs for the first six months of 1957 over the same period a year ago. However, the airline and expenses rose 30% and net earnings dropped 57%. Eastern's load factors dropped from 64.4% for the first six months last year to 61.0% this year.

United Air Lines reported a 65.1% drop in net profit this year as compared with the first six months of last. Operating revenues increased 5% but operating expenses went up 13.5%.

American Airlines recorded a 36.1% drop in net profit. Revenues increased 6.3% and expenses went up 13.5%.

Two airlines, TWA and Capital, reversed the industry trend by reporting better operating results during the first half of 1957 than in the first six months of 1956, although neither showed any profit. Capital's loss amounted to \$769,941 as compared with a \$154,187 loss for the first half of last year. TWA reported losses of \$1,114,800 for six months last year as compared with a \$1.7 million loss last year.

Transport Association President Stuart Tipton and the Board's action "is, in our view, deeply disappointing to the airlines. At the heart of the airline proposal was their desire to take every possible step to meet the actual financial problems arising out of their rising equipment replacement."

Unfortunately, the majority of the Board, although willing to increase continuing surveillance, was not concerned of the seriousness of the problem or the urgency of solution. We are certain in the weeks and months ahead the need for a fare increase will become more and more obvious."



DC-8 Assembly Is Underway

First photographs of the Douglas DC-8 jet transport under construction in Long Beach, Calif., show fuselage and wing that indicate main components. Nose section (opposite page) is also taking form. Extra windows on top of main cabin will be installed in the required spaced rows. Early drawings of the airplane showed it as a biplane shape.



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GREETINGS

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Northwest Gets Permanent Tokyo Route

Washington—President Eisenhower has settled the long-standing dispute over commercial air routes across the Pacific by last September, by approving Civil Aeronautics Board recommendations in two transpacific route cases.

The two separate but related cases involved Northwest Airlines' application for permanent authority to fly the Great Circle route to Tokyo and Pan American World Airways' application to parallel Northwest's route.

Specific CAB recommendations approved by the President are:

• **Permanent authority** for Pan Am to provide direct service between its California terminals and Japan with operational steps in Alaska.

• **Denial of Pan Am's** application to parallel Northwest's Great Circle route to Tokyo via Portland and Seattle.

• **Permanent authority** for Northwest to conduct operations between Portland and Seattle and Tokyo on the Great Circle route.

Pan Am's present temporary authority to fly from Los Angeles and San Francisco to Tokyo via Hawaii on the Great Circle was not at issue in either case. This authority expires in 1960. Hearings will be held then to determine the future pattern of open ton.

President's Changes

With the exception of authorizing Pan Am to fly direct from the U. S. to Japan, the President approved recommendations similar to those presented by the CAB in December 1959. At that time the President modified the Board's recommendations and ordered that Northwest be awarded a transpacific route instead of permanent authority, and held in abeyance the Board's recommendation that Pan Am be denied authority to parallel Northwest's route.

Last year the President asked the Board to remove Pan Am's application to fly the Great Circle route. At the same time the Board also acted on Northwest's request that its application for a permanent certificate be resubmitted to the President.

Although the President settled the route by approving the CAB recommendations he left the door open to renewed battles between Northwest and Pan Am over the issue of a reroute of U. S. Tokyo traffic. In a letter to the CAB, the President said it is the Administration's objective wherever traffic patterns to provide competitive U. S. service on all international and oceanic routes from all ports.

asked the Board to advise U. S. Tokyo traffic, insofar as possible, and to report the situation to him at least once a year.

During hearings on the proposed transpacific case, the American Airlines, it added authority to serve Portland and Seattle over the Great Circle route in order to compete with Northwest for transpacific traffic and to maintain its economic stability in that area.

The company said its longer central Pacific route to Tokyo placed it at a competitive disadvantage. Pan Am also contended that granting it equal access to Northwest's Oregon and Washington terminals would have the economic advantage of Northwest's transpacific operation.

FAA Arguments Rejected

The CAB, in its decision said: "We find that these arguments have no greater validity today than they had three years ago when they were last rejected by another hearing committee and a different composed Board. We are convinced that there are no new circumstances or developments which warrant granting PAA's application in order to let it operate service rights over the Great Circle route from the Pacific Northwest."

"It is held that PAA does not need to duplicate Northwest's Tokyo service to maintain its competitive position in the transpacific traffic market, indeed we are convinced that such duplication would necessarily lead to unnecessary duplication by PAA in that market."

The Board said its earlier conclusions

regarding PAA's claim that its Pacific routes needed strengthening were based on substantial and upon PAA's unsubstantiated competitive advantages over Northwest flying from its greater east coast extensive Pacific routes established market and other position in the world, and its present ability to international travel due to its wide scale international route system.

PAA's Strength Denied

There is nothing in this record," the CAB said, "which indicates that these PAA advantages have lost their significance, and that PAA now needs additional route strength to maintain itself in the competitive struggle with Northwest."

"In fact the record shows that, since the close of the earlier hearing on this proceeding," the Board added, "PAA's Pacific division has developed into one of the strongest international routes in the world. It generated the highest transportation revenues per plane-mile of any of the 17 United States foreign and oceanic routes. In terms of income, passenger miles and revenue ton miles it is held third. In fact, PAA has accumulated route segments which have greater density than Northwest's entire Pacific route."

"Thus, PAA's California-based segment alone generates more than four and one-half times as much traffic as Northwest's entire North Pacific route and constitutes a total part of the strength of the Central Pacific routing. In addition, PAA has almost twice as much traffic over its Hawaii-Tokyo



American to Expand Tulsa Base

American Airlines will begin a \$28 million program to expand its Tulsa, Okla., central base for its fleet of Lockheed L-1049 Super Constellation and Boeing 707 jet transports. Base, located through lands owned by city, will be ready for jet introduction in 1959.

Airline Traffic—June, 1957

	Revenue Passenger	Revenue Passenger Miles (RPM)	Load Factor	U. S. Mail	Revenue	Profit	Total Revenue Per Airline	Per Cent Revenue Is Available To Passengers
DOMESTIC TRUNK								
American	758,331	302,283	74.9	1,447,033	353,108	7,108,028	47,973,387	10.1
Boeing	177,435	79,107	64.9	347,221	74,181	611,163	3,902,118	10.1
Continental	371,437	145,400	64.4	808,317	130,719	496,485	14,191,449	11.4
Eastern	76,408	32,117	61.4	165,843	29,201	166,716	3,833,189	10.4
Delta	291,347	115,751	64.4	589,757	104,446	1,941,497	36,867,801	17.26
Northwest	177,279	84,749	64.8	377,136	375,580	1,941,497	36,867,801	11.4
Southwest	114,817	49,830	64.9	240,821	41,984	424,107	7,470,203	11.4
Texas	20,355	20,355	100.0	14,347	14,347	21,777	3,314,422	11.4
Trans World	136,360	100,313	66.9	407,141	110,849	910,439	11,844,897	10.7
United	432,712	198,119	71.9	920,363	340,144	3,394,203	19,121,147	14.6
Western	94,116	460,281	74.6	1,267,446	448,201	6,148,028	10,668,122	17.3
World	134,450	60,011	47.1	231,452	46,843	391,503	6,866,469	10.2
INTERNATIONAL								
American	11,991	8,332	69.6	1,047,195	441	376,863	1,116,204	46.9
Boeing	4,508	5,186	96.4	10,277	45,567	1,097,897	8,879,897	82.2
Continental	1,732	1,732	100.0	1,732	5,321	13,612	33,391	39.9
Delta	5,109	7,870	63.4	4,517	19,240	9,666,891	37,3	11.4
Eastern	21,963	68,444	35.2	81,731	1,047,274	13,218,091	46.9	11.4
Northwest	6,007	4,845	80.6	7,474	23,766	13,218,091	46.9	11.4
Southwest	11,776	38,842	33.2	911,199	10,448	4,047,134	73.8	11.4
Texas	5,332	16,119	31.9	43,807	310,775	1,380,334	39.1	11.4
Trans World	118,074	148,276	79.6	919,190	1,917,321	36,446,812	45.3	11.4
United	107,891	181,772	67.9	370,463	1,411,446	16,230,411	45.3	11.4
Western	9,569	56,9	58.9	39,712	18,214	49,828	46.1	11.4
World	11,469	16,129	39.9	16,124	291,472	1,916,614	27.4	11.4
World	91,444	17,027	72.7	738,875	408,440	54,498,097	46.4	11.4
World	11,807	19,540	77.4	97,702	76,331	1,174,280	46.3	11.4
LOCAL SERVICE								
Airways	65,121	7,701	59.6	8,072	13,416	36,831	377,161	10.26
Boeing	12,334	2,472	67.1	4,161	1,492	6,274	948,536	10.4
Continental	2,434	1,268	52.5	8,088	2,119	10,840	1,111,111	10.4
Delta	10,833	1,194	10.7	1,027	6,864	64,197	397,176	11.4
Eastern	35,444	35,444	100.0	26,438	165,231	349,190	7,028,096	11.4
Northwest	65,379	10,181	66.9	20,287	15,473	1,163,797	70.4	11.4
Southwest	36,115	4,184	11.4	4,184	15,473	1,163,797	70.4	11.4
Texas	10,181	1,018	10.1	1,018	1,018	1,018	1,018	10.1
Trans World	18,177	2,479	66.9	8,845	18,177	37,197	46.7	11.4
United	10,181	1,018	10.1	1,018	1,018	1,018	1,018	10.1
World	31,711	5,181	49.9	13,142	8,234	31,711	31,711	11.4
World	24,321	4,331	35.0	4,370	1,061	1,061	428,434	41.0
HAWAIIAN								
Boeing	41,737	5,364	12.6	3,362	114,872	449,136	44.7	11.4
World	22,508	2,508	10.9	1,193	11,961	340,363	44.7	11.4
CARGO LINES								
American	13,770	61,771	19.6	20,495	5,122	6,216,614	10,944,744	82.7
Boeing	4,104	24,371	44.9	61,150	2,472,104	4,380,744	79.4	11.4
Continental	8,111	36,420	27.9	11,908	4,414,161	8,841,161	84.4	11.4
MILITARY								
Chicago	5,403	79.9	10.1	3,349.9	1,000	16,300.9	36.1	11.4
Boeing	1,412	182	10.0	1,412	1,412	1,412	1,412	10.0
World	7,104	131	10.1	1,420.1	1,316	132	18,107	43.6
ALASKA								
American	767	1,170	10.0	12,866	173,418	316,636	41.9	11.4
Boeing	5,161	497	10.0	3,418	4,504	46,636	41.9	11.4
Continental	7,367	340	10.1	1,768	5,321	45,316	44.8	11.4
World	11,723	16,176	14.6	14,495	164,071	1,446,464	47.6	11.4

*Not available.
World available in full.
Compiled by AIRWAYS WEEK from reports to the Civil Aeronautics Board.

agreement as Northwest had only one North Pacific route. And the Honolulu-Madison agreement of PAA's Central Pacific route generates as many passengers as Northwest did over the entire North Pacific.

In this setting, the CAB said, it would be inconsistent with established National policy, involving balanced competition between United States flag carriers to grant PAA a new and additional competitive routing, across the Pacific in the absence of compelling reasons.

As to the Coast Creek route from the California Gateway, the CAB said, we agree with the Economic Committee on the carrier's position regarding the serving the California gateway route should be afforded the necessary four slots to improve its service to these points to the full extent possible in view of the fact that no other carrier can be shown without serious consequences to another carrier.

On question of operating rights, the CAB said it was inconceivable that the United States would at any time so the foreseeable future transmute the right of either Northwest or PAA to avoid Tokyo, and thereby grant the other carrier an exclusive right to such route.

"Under such circumstances," the CAB said, "it is patent that both carriers are entitled to and can receive permanent authority for Tokyo service without adversely affecting any needed flexibility in further adjustment of the trans-Pacific route structure which might find in the public interest when we next see evidence in this area."

The Board was unanimous in its opinion in both cases, although it found each route members on the Board when and agencies were held.

SHORTLINES

► Delta (Atlanta to Spang) will begin a fourth nonstop service on Aug. 15 with the idea of getting in on the westward rush at Honolulu from Europe. The flight, a Lockheed Constellation, transited from the San Francisco route, will leave Honolulu on Friday and arrive in New York on Saturday, then return and depart for Madrid the same day, serving the Sunday.

► American Airlines will begin non-stop Douglas DC-7 "Round Globe" service between Chicago and Los Angeles on Aug. 30. One flight each in each direction, is scheduled for the 35-day month. On Aug. 30, American will be given DC-7 "Round Globe" between Chicago and San Francisco.

► Airline Cleaning House reports that new business transactions during June

AIRLINE OBSERVER

► Pan American World Airways and Northwest Airlines are not expected to lose one minute preparing for another big battle over an ocean route, now that the struggle over trans-Pacific routes has been settled, now that the North Pacific will be over several of its between Seattle, Portland and Honolulu. Both have suffered heavy losses on the route since inauguration of service in 1946, but each will go all out for renewed efforts to get the route on an exclusive basis. Trans-Pacific authority of both airlines appears not far away.

► Eight-month-old airlines preparing jet aircraft to have pilot certification for landing at the South-Texas International Airport have been instructed. Restrictions were adopted when the airport was opened in 1949 and little was known about effects of wheel loading, jet blast and other factors affecting commercial operations. Similar restrictions will be in effect at New York's Idlewild International Airport, where the Boeing 707 was released permission to land on a recent transcontinental flight. Smaller Jet Aeronautics Co., French commercial jet, was prevented to land there, however.

► Egypt and the United States have agreed to a new air route between the two countries. The route, to be operated by TWA, will be through Iceland to the United Kingdom and Germany, and intermediate points. But although the United States would at any time so the foreseeable future transmute the right of either Northwest or PAA to avoid Tokyo, and thereby grant the other carrier an exclusive right to such route.

► Capital Airlines will proceed with plans to provide reduced economic fares for groups of persons of 25 or more traveling between specified points and airports in restoring their services on Saturdays and Sundays. The plan originally specified student groups, but Civil Aeronautics Board officials found this difficult to administer. However, CAB said it could relax its traffic without the student restrictions within 15 days, the new rule will be issued to the aviation for further proceedings. Expense of the plan, according to Capital, is to generate additional traffic on days in which Capital's traffic is unusually low.

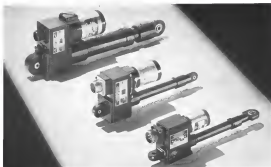
► Scheduled airline service has been interrupted by Airline Airlines at Atlanta with five daily round trips between Tucson and Ft. Huachuca, a distance of about 700 miles. Equipment used on the route are Lockheed B-24s.

► Canadian Pacific Airlines will add two new foreign flights to its international service. CPA's London service will be extended to Madrid on Sept. 5 and Santiago, Chile, will be added to the airline's South American service on Sept. 25. CPA points out that traffic rights have been granted from Santiago to all points north, but not between Santiago and Buenos Aires, the present South American terminus of the center.

► New-entrant airlines have dropped out competition for passenger traffic between the West Coast and Hawaii. Great Lakes Airlines has offered a \$99 fare on 60-passenger Douglas DC-4s. Transocean Airlines has held to a \$119 fare, but is now using Lockheed Super Constellation between the mainland and Hawaii to cut flying time. Scheduled airlines offer a third fare of \$129.

► Thai Airways officials have been looking over plans of future facilities at Los Angeles International Airport with a view to inauguration of service between Bangkok and Los Angeles under the U. S.-Thai air transport agreement. Thai Airways recently took delivery of the first of three Lockheed D49C Super Constellation which are expected to be used for the international route.

► Incident commercial operators reported nearly more than 12,440 pounds and which are moving shipments, are now being changed rapidly into less among from 57 to 53 at the state-owned airport in Lansing, Mich. But airline pilots are accused the loading loss and which provides, greater from the State of Michigan airport, are entitled to a rebate of two cents per gallon, applicable to but not covering the amount of loading for



Three new Airborne modular actuators—rated 2500, 650 and 2500S. Top to bottom—act not standard to this year's design. They are mounting bracket variants of the 2500S of different linear stroke (model 2500S) and the 2500S of different linear stroke (model 2500S) and the 2500S of different linear stroke (model 2500S).

New Airborne modular design concept simplifies actuator selection

Airborne's new modular actuators represent a completely fresh design approach. Whereas in the past we offered a line of standard linear actuators, we now offer a line of standard actuator components grouped in three broad operating capacity classifications: L15, L16 and L30. All components within a given classification are interchangeable.

For example in classification L16 (150-1500 lb range) there are 32 standard components or modules including motors, gear units, jacks, etc. Being interchangeable, they can be assembled in literally hundreds of variations to give you exactly the actuator you need.

operating capacity and package configuration you want.

Because of this new modular design concept, actuators built of standard Airborne components now meet almost 98% of the linear actuator requirements of modern aircraft. As a result, most specially new become standard. You have greater design freedom and get better delivery.

Furthermore, while redesigning under the new modular concept, we were able to reduce the size and weight of many Airborne actuator components. You get more power in a smaller package, save precious weight and valuable electronic space.

For more information write for our new Catalog 37A.



Airborne modular actuator classification L16 is composed of 32 standard interchangeable components. Over 200 different linear actuator variations from 150 to 1500 lb. are possible. One can be obtained from these 32 components.

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Describe the actuator you need, give operating capacity, stroke, etc. We will give you the actuator you need, or a suitable alternative. We will also give you the actuator you need.

more up 10-15% over 1965, of last year. Total airline business transacted was \$64,977,606 in compared with \$55,771,828 in June, 1965.

►Pan American World Airways will be the first to stop first class tourist Douglas DC-7C flights to Rome from New York on Oct. 27. New service will be in a form of three flights a week. PAA also will begin daily non-stop DC-7C flights to Frankfurt also on Oct. 27.

►Pan American will begin service to the major airports in Europe using the Polar route about Oct. 10. Two flights weekly will use Douglas DC-7Cs from Los Angeles and San Francisco Direct flights to Europe from Seattle Portland will be started later in the year. Trans World Airlines has not yet announced plans for its flights over the Polar route to Europe.

►Deutsche Lufthansa, the West German airline, will add eight additional passenger flights between Hamburg and New York during August and September to handle unexpectedly heavy traffic. Additional flights from Hamburg via Frankfurt and Shannon will depart Aug. 19 and Sept. 2 and 9. Return flights from New York will depart on Sept. 3 and 10. Lufthansa already has flown one non-stop flight on Aug. 5 and two scheduled flights on Aug. 6 and 8. Its first air service at 1957 Lufthansa carried 16,456 passengers on its North Atlantic route.

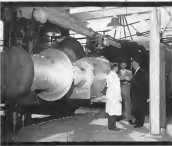
►British Airlines carried nearly 7.5 million passengers during the financial year 1966/7, government figures show. This is an increase of 12.4% over the previous year. British Overseas Airways Corp. carried 394,800 passengers, 7.5% more than last year and British Europ. Airways carried 2,462,200 passengers, 10.6% more than the previous period.

►Shack Airways has sold a Douglas DC-6A aircraft, subject to CAB approval to Alaska Airlines for delivery on or about Aug. 15. Shack has five new DC-6A aircraft on order with Douglas Aircraft Corp. for scheduled delivery in spring and summer of 1958.

►Northwest Airlines carried 91,183 revenue passengers during July, it is reported to \$9,516 for the same period in 1955.

►Pacific Northern Airlines' common stock has been listed on the Pacific Coast Stock Exchange in both Los Angeles and San Francisco. The company's shares will continue to be traded on the American Stock Exchange in New York where it first appeared in 1953.

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VOUTOUR appears much larger than it actually is. Plane has 30 ft. span and length; it built low to ground. Average man can look

Delay, Stretchout Nibble at Technical Life

By David A. Anderson

Post-500 Airborne's 500-4070 Vautour, the machine of France's jet bombing and all-weather force, now is being delivered to squadrons of the Armée de l'Air.

The first jet Vautour was developed to the general concept of one airplane capable of doing three different war missions: ground attack, low-level bomber and all-weather fighter. Ordered in quantity, the Vautour has been accelerated by

representations received on it by numerous changes in Airer staff and leadership. Today it is the only jet bomber available to the French. It is also the only relatively modern, all-weather fighter, and is replacing the semi-Gloster Meteor variation that has served for so long.

How Many Does?

Figures on production rate and numbers in service have not been made available. But many observers claim

that the total force of Vautours in the Armée de l'Air was acquired to make the 15th of 12 that was one feature of the secret 22nd Salon de l'Aéronautique.

And Anderson says that production of the airplane can be measured in dozens, but whether two or ten. And doesn't say.

Production is about evenly divided between the all-weather version and the bomber. Only a handful of the ground attack version is to be built.

Basic layout of the Vautour is to the aerodynamic formula of 35 deg. of sweep in wing and tail. The wing is mounted at shoulder height and has a slight negative dihedral. Engines are pod-mounted, flush with the under surface of the wing.

Weight of the Vautour at takeoff varies between 33,000 and 40,000 lb. with the maximum. Wingspan is 30 ft., overall length 36 ft. and maximum height 14.7 ft.

Performance is subsonic, with a top level maximum speed around Mach 0.9. Rate of climb after takeoff for a production Vautour at normal gross weight is about 11,000 fpm. Takeoff and landing requires a normal run of about 2,000 ft. on landing runway, more on paved steel planking or other make-shift surfaces. Ceiling is more than

into nozzle almost along these lines.

of Vautour

50,000 ft., but operationally the airplane works better at lower altitudes, probably not exceeding 45,000 ft.

Three Noses, One Body

Essentially the Vautour is an infinite power plant combination that can have a variety of armament arrangements plugged into it to match its mission. It's not quite that simple as built production airplanes are being turned out in batches of each type because there is a little more difference between the planes than it appears. But there is a very high percentage of parts common to all three—perhaps 95% or more of the structure is the same.

• **Vautour N** is the all-weather fighter. Now, latest carries a nose of two in tandem sitting behind the podged radar and even the gun battery.

• **Vautour B** is the light bomber. This also is a two-seater, but the bombardier sits in the conventional glassed-in nose behind the bomb bay, sight and computers.

• **Vautour A** is the ground attack aircraft. It is a single-seater, with the pilot's position above the gun battery.

A large bomb bay is reserved for all the versions, and carries a variety of weapons depending on the mission.

Powerplants for the Vautour are a pair of SNECMA Atar 101 B3 turbojets



NIGHT-FIGHTER Vautour makes up first batch of the two-seater craft off the first Vautour production line. Armament is extremely heavy, total is four 30-mm cannons with 400 rounds, 240 rockets in the fuselage bay and 75 rockets under the wing in pods.



VOUTOUR is shown here in close version with no armament except fuselage gun pods.



VORTER, grounders and wing fences help the dynamic performance of the Vautour. With its 15deg. swept wing, Vautour is capable of speeds over 700 mph. on the deck, a slightly superior in a dive. Variable-incidence tail will be replaced on later production planes by a def. tail now being studied as fourth production ground attack airplane.



NOVELTY gun is used on the Vautour with magazines on each engine nozzle. In spite of that gun, takeoff distance is relatively short, about 2,000 ft. at its normal gross weight.



All-weather fighter

GUN PACK and rocket pods in bomb bay are two structural items of night fighter version assumed. Naucles of seven centimeter rockets can be stored in a maximum of 240. Complete 50 mm gun package (below) is ready to be mated into place. Four curved ports on nose indicated are shell case deflector, fusible rocket motor bay

ated at 3,900 kg (8,580 lb) at 8,400 rpm for 15,000 ft/min in later Vautour can be the Alfa 101 D4 with an increased thrust rating of 1,700 kg (3,748 lb).

Sad Aviation designs Post, capable rate for the Vautour line, figures the plane has considerable growth potential and could be a first-line instrument for another four years or so. In armed power could improve the altitude and rate of climb performance, although high-speed performance is degraded.

New Modifications

Fuselage in flight with the hazzarded led led to several investigations and refinement of the visible structure.

At the end of the fuselage, the "nose" is the French design of the French production ground-attack aircraft is being fitted with the nose, tail fin, and other modifications. Even though the fuselage has been tested as the original tail fin, Sad engineers will make the shift on the production line to the new surface.

Wing drop and push-up problems, encountered in early flight tests of the Vautour, led to the most significant modifications of wing fences and vortex generators. These troubles have been cured but a further aerodynamic change is in the works. A reinforced, extended leading edge has been designed and flight tested on the seventh production airplane in order to increase the takeoff and landing lift coefficients and to improve the turning ability—in increasing available lift coefficient—in maneuvering flight at high altitudes where the plane is at a high angle of attack.

For this change which will be fit

into the production line and made a retrofit through the use of field service modification kits, the wing fence has been moved forward about 10 in. The leading edge extension must from there to the wing.

Vautour Armament

Variety of heavy armament is one of the basic design concepts developed in the Vautour. Starting at the nose with the nose of a variety of 30-mm cannons, the Vautour mounts a starting array of rockets, bombs and other stores carried internally or along externally in pods or on Chakravarti-type rigs.

Standard armament arrangements for the three basic model variations of the two-yr plane are these:

- **Vautour M** all-weather fighter carries 4x30-mm DEFA cannons with 100 rounds per gun in a nose package. The bomb bay holds a rocket tray that mounts a maximum of 240 SNEB air-to-air unguided rockets. Underwing rocket pods can be fitted, three Matra Type 135 launchers load 10 SNEB rockets in the familiar home-on-target pattern. Five rocket pods can be carried for a total of 75 rockets. Arrows that can be carried either in the bomb bay or under the wings if in the rocket armament must be proportionally reduced.

- **Vautour B** light bomber does not use a gun, but carries up to about five tons of bombs. The major portion is carried in the long bomb bay which can accommodate a 1,000-lb bomb. Five 1,000-lb bombs can be carried under the wings on pylons. The most variations in the internal and external stores—fuel, napalm, air-to-ground missiles—can also be fitted, depending on the mission.

- **Vautour A** ground attack, aircraft is armed with the same 30-mm cannon and, used in the all-weather version. The rest of its armament can be varied for the specific mission.



Ground attack

for the specific mission, but usually would include air-to-ground targeted rockets in bomb bay bays and under the wings.

Fire Control Radar

The Vautour N is not yet a complete automatic night fighter in combat, but the plane would be oriented



SLICED BOMBE B 10 is first Avionics development, was deployed at 22nd Pan Air Show as part of the Vautour armament although the bomb is not yet an operational weapon. Configuration is consistent of Avionics and Baza bombs and specifically with some variants by USAF during World War II.



CRITICAL TESTS of a proposed radar before the early studies of the Sad Vautour. Note various positions on upper and lower surfaces and the large wing fence protruding from the upper surface between the pylons. Rocket pods containing 15 rounds each are part of the armament for the night-fighter version. Package is Type 135 not built by Matra, French source and armament firm.

towards the target in ground control. Its own radar would perform the next steps of target acquisition. But because the radar is not yet used in the ground role, the pilot must fly on the visual penetration in the cockpit. The radar determines the range and faces the guns or missiles.

The radar system for the Vautour has been developed in France by the Compagnie Générale de Téléphonie son F1 (CGT). Complete architecture of the fire control system is under development and will be installed in later production Vautours.

Tests of the radar system in the Vautour began in 1974 and have continued ever since. Fitted in that working form were made with all the standard improved improvements. Full fire-outs of the cannon battery were made in several flight missions and mounted light attacks. Rockets also were launched in several tests. Sad Avionics says that all of the armament tests were highly satisfactory. No problems were encountered with collection of gas gases in the bay, but at Malan-Villeneuve, one problem, which had already been noted for long time, showed solid signs of large cracks



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to the stanley steel plate surrounding the gun ports.

Roads run up to the minimum permissible speed of the Vantona have produced a smooth landing with the bomb bay open, regardless of the type of stress created. There has been no case of bomb hanging.

Production Plants

Vantona production is divided among three of the Sud Aviation plants.

• **Saint-Nazaire, near Nantes**, on the Bretagne peninsula, is the key plant. Final assembly of the Vantona is done here, and, in addition, the fabric, rivets, the forward and aft baggage stations. The adjacent outfit at Gern is the flight test center for the Vantona production program. Factories have about 2,900 employees working in about 750,000 sq ft.

• **Bordeaux, also near Nantes**, is the source for wings and fuselage. This shop is especially well equipped with machine tools, including gas turbines and other heavy production machines. More than 2,000 people work here and the plant area is about 500,000 sq ft.

• **Rochefort, farther south** on the Gironde Gulf, produces tail sections and aft baggage. Presently both of this plant is the production of the Dassault Phantom fighters about 600 people occupies about 250,000 sq ft. of enclosed surface.

In addition to the three plants of Sud Aviation, subcontractors are also brought into the Vantona program.

Structural Makeup

The bomb bay of the Vantona is probably the deciding factor in laying out the structure of the airplane. The use of this cabinet, plus the loads imposed as a light bomber in ground attack, determine the construction of the structure, meant that an exceptionally rigid structure had to be planned.

Consequently, the baggage structure can be viewed as a shell with a flat bottom which forms the upper floor of the bomb bay, wheel wells and rearward ends. To this flat bottom are attached the necessary, filigree and



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doors to cover the wheels and bomb bay.

Only four longitudinal support the shell structure; there are no intermediate stringers.

Wings and tail sections are made from large panels of rivet, skin with stringers attached by metal bonding.

The bomb loading gear is made by Hispano-Suiza. It extends fore and aft of the bomb bay. Turret loading lights are extended on the nose gear. Landing gear gear is mounted in each nacelle. Main gear doors are made by Dassault, size 32 x 16.08. Tire pressure is 6 kg./sq. cm. or about 51 psi.

Original order for the Vantona was

several hundred, but recent economic slumps have reduced this number sharply. Observers expect the total order not to exceed the 140 requested in the last production batch. Sud Aviation says that the potential production rate is 15 per month, but the factory is now capable of turning out 12 per month, and that both these numbers are considerably higher than the current required delivery rate.

The Vantona has many interesting features—first built in a design study in 1951. One of the production forms of Sud Aviation, Securo, was the re-sizable company.

Background to the design was simple:

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Titanium Track

Slat track for wing loading edge slat Doug Air Aircraft, Inc., El Segundo, Calif., Div., engineers designed out of titanium. Compared to the old part which it was intended to replace, the largest titanium track weighed 40% less, maintained compass deviation, and cost less to produce. The lighter weight reduced the strain both on the slat and 23,000 cycles of repeated impact loads showed no cracks or failure. The titanium alloy used was SA1-4V (for per cent titanium and four per cent vanadium). It developed a maximum of 150,000 psi ultimate strength at 13% elongation.

It never had no sudden bumper force and never was on the edge. There was no bumper squanders which later were to be served in Palo Alto, but these were equipped with impact aging Doug by 3-25 percent-weighted location.

There had been an extensive attempt to design a jet bomber. The SD-3000 was Project's first project jet bomber and it flew just once, on March 16, 1955. It never got off the ground again. Its powerplants were a pair of Hallamore-Norris built by Hispano-Suiza and developing 5,000 lb thrust each, but the intake ducts were long and the thrust boosters were high. Besides, the engine weighed close to 50,000 lb. One of its test vehicles, the half-size SD-M 2, did fly well. It was dependent on the power of its single Hallamore-Dumont engine rated at around 5,500 lb.

These attempts produced nothing, but were the direct antecedents of the Vector.

Design studies began in June 1955, as the Vector, less than three months after the fly-and-missile flight of the SD-3000. The original program for the plane called for delivery of production aircraft starting in the spring of 1956. The schedule, incidentally, was kept.

Construction of the first prototype took 14 months, and it flew for the first time on December 15, 1957. Three prototype aircraft were built, one of each type. These were followed by six production aircraft, of which the first took its first flight on March 15, 1958. The remaining time was spent in flight testing and in coping with the changes in planned use of the Vector. "Even, five the Area, got a new chief of staff who changed the design," one engineer related.

At schedule, the first production air-

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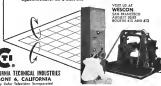
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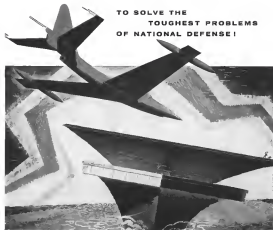
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only flew a little over one year ago, on April 18, 1956. It was destroyed in the military during that spring.

By the beginning of January this year, only one Vought had left the factory for the military. The design has been stretched to a lot of things, contract airplanes, turbopropellers, changes in requirements, changes in the order of delivery of the various types. What ever the case, the effect is obvious: France still has no jet bomber fleet, and its air carrier capability is very low.

Future Versions

Future plans for the Vought include a modest carrying development and the SO-4000 Bomber, set at a "Super-Vought." But time is running out fast for the Vought. Its performance is comparable to the thousands of Russian Ilushin 28 light bombers now in use on all sides that have the last Combs B. At the time it is in full production, it will be obsolete technically, even though it could make a good showing for itself if war came.

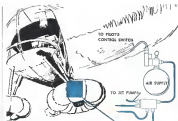
Only two things can now save the Vought program: A tremendous increase in production rate or a change over to a new, more contemporary design. The first depends on funds, like everything else in France. The second depends on funds also, but it is connected to the political future of France.

Should the French decide to speed up production, Sd has the capacity. Should they decide to order a new prototype and launch a new program, Sd has the technical ability and the designers to do the job.

Four New A3D Types Planned By Douglas

Los Angeles—Four new versions of the A3D Supersonic transport attack bomber to extend versatility of this current-model plane were outlined by E. H. Housman, chief engineer of Douglas Aircraft Corp.'s El Segundo Division at a meeting of the company's management club. These A3D versions include:

- A3D-3D fitted with nonstreamlined configuration and accommodating crew of seven. Avionics Wings have revealed plans for this and the A3D-2P (see below) on Apr. 16, 1966 (p. 27).
- A3D-2P photographic plane fitted with 12 cameras and ranging crew of three.
- A3D-1T turbopropeller bomber fitted with radar bomb sights and navigation gear. Plans will accommodate six turbines and one turbojet.
- A3D tanker, which will be a regular production A3D fitted with a special large refueling boom in its bomb bay. Communications, photographic, and



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maneuvering will be production models, with fully programmed fuelage for high altitude flight. They are scheduled for first flight next year.

Douglas E1 Segue's most recent development in both fields is the Aero NECA, on which test flights were completed in 15 working days from first drawing release. Back to be test with a new 3,200-lb weapon to be carried in the A1D and other aircraft.

Another development for the A1D is a single look, 5,600 lb-capacity shuttle. Aero 2A, capable of carrying large atomic bombs.

Not yet specified for any plane is the Aero 3A roll, an experimental unit containing explosive holes instead of atomic bombs. Back also contains a pseudo-type duplicating gear.

For the Office of Naval Research, Douglas E1 Segue is engaged in the development of advanced reconnaissance, especially for combat aircraft, and has also worked with approximately 25 contractors engaged in fields of engineering psychology, physiology and in structural development. Research and

This equipment is its final form is intended to present on a flat television-type tube a complete coordinated presentation of steering and attitude information, which may look like a "highway in the sky." Coupled with this would be a plan position indicator (PPI scope) on a tube in front of pilot.

Improved Titanium Still Has Shortcomings

Titanium used in aircraft and engine components is improving in quality but several shortcomings still remain, according to a Cornell Aeronautical Laboratory report.

This report presents the results of a survey of manufacturers regarding the mechanical properties, physical characteristics, and forming properties of the titanium they used in 1956. A similar survey had previously been made for 1953 and was used as a base of comparison for the present report.

Indications are that the quality and availability of titanium produced for the aircraft industry has shown improvement in every respect. However, in its current state of development the material still falls short of the aerospace industry's requirements in the following areas:

- Variation in thickness
- Hydrogen contamination and pore volume limits
- Flaring and extruding difficulties

The report ended with a recommendation that a standard of surface condition be set by mutual agreement between titanium producers and aircraft manufacturers.

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The Model E-3545-1D ADAR System records four channels of analog voltage data and plots these data as four non-overlapping quadrant analog traces, each trace resolved to one part in 64. The system is particularly suited to the plotting of transient phenomena since the multi-trace plotting technique eliminates problems due to damping, overshoot, resonance, and other mechanical limitations. The chart requires no processing, and the plotted data are therefore available for immediate viewing and interpretation.

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VARIABLE STABILITY and control airplane is flown as normal T-33 during takeoff and landing by test pilot. At test altitudes, test-pilot flies via airplane's automatic control system. Airplane can usually simulate other aircraft characteristics.



ORIGINAL HOUSING of the modified T-33 has been replaced with larger nose of F-94 to provide for electronic components of automatic control system. Control system computers in nose-section enable computer, contains about 150 miniature vacuum tubes.

Cornell's T-33 Simulates Any Jet Plane

By Robert Staakfield

A-13 test airplane that, like an F-94 prototype, can simulate other jet aircraft in their full-scale flight characteristics and also simulate some new designs still in the design stage, has been developed by the Cornell Aeronautical Laboratory.

Variable stability and control airplane, equipped with variable system for rudder, elevators and ailerons, is expected to provide answers to stability and control questions well in advance of flight test and under conditions where the test configurations can be readily varied (AW June 3, p. 257).

The earlier Cornell F-94, by comparison, was modified only for variable longitudinal stability and control. Airplane transmitted the test pilot of Cornell's B-45 Thunderbolt that airplane's longitudinal handling qualities long before its first flight.

CAL Program

CAL program is sponsored by USAF's Air Research and Development Command. Direct responsibility lies with Aeronautical Research Lab center of the Wright Air Development Center. Work was initiated in late 1954. Flight testing commenced early this year.

Modified T-33, in which smooth, nose and control system configurations can be varied by changing the shape of its nose-tips, can simulate any aircraft's longitudinal handling qualities long before its first flight.

- Tracking accuracy, during short, high speed target runs. Ease of tracking depends on stability and control characteristics.
- Cockpit control design, in which airplane's handling characteristics would be matched to pilot. Better design could make more accurate tracking at target possible.

The flight testing T-33 makes it possible to vary the important parameters



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Warren, Ohio  "Liaison" Division of General Motors



AUTOMATIC control console in rear cockpit of T-33. During flight, as before takeoff, pilot sets set up desired "magnets" through these 40 gas controls on console.

—wing open, tail area and movement of various independently and freely.

Varied Simulations

In its simulation of other airplanes the T-33 console can be set up to simulate the individual characteristics. These can be varied quickly to meet light passing approaches to a problem.

Handling characteristics of airplanes still in design stage can be simulated and tried out with an advance of aerial flight tests. If need be design can then be modified based on actual ground tests.

That's simulated, for example, is the response fighter simulators wherein the airplane tends to have low moments of inertia in roll compared to the moments of inertia about pitch and yaw axis.

The T-33 is adaptable to research in cockpit control design. This includes not only physical design, but type of aircraft response to control position.

Effective gearing ratio between stick movement and elevator angle can be varied over wide range. Automatic trim contribution can be provided. Instead of a rolling velocity, a steady bank angle may be simulated in response to steady lateral stick deflection, etc.

That's how airplane simulator.

• **Asymmetry in design** of several T-33 during takeoff and landing by command or "safety pilot." Controls, controls and switches related to its normal functions have been qualified to make it more like a "real" airplane from the air.

• **At low altitudes**, front-end or "breakdown pilot" has an airplane's automatic control system. However, open to pass control sensations during safety pilot to move controls during all phases of flight.

• **Original nose** of the T-33 has been replaced with larger nose of T-34 to provide for electronic components of automatic control system. These are also installed in cockpit, wheel wells, wings, pressure chamber (head of crystal and tail section).

• **Safety pilot** with up desired "magnets" before automatic control system is engaged. This can be done before takeoff; it can also be changed during a flight through the 40 gas controls on his console.

Control Settings

The setting of each gas control is visible to the pilot through a small window and is presented in two digits. Pilot may select any setting between 00 and 99. Numbers greater than 59 equal "positive" gas. Numbers less indicate "negative" gas.

Electric, silicon and resistor controls in the front cockpit are mechanically disconnected from their respective control surfaces.

They are connected instead to three separate electrohydraulic actuators.

The "artificial feel" system has been designed so that other conventional stick or a wheel and column can be certified in necessary.

A broad set of control surfaces, another surface, has been added to the nose of the airplane.

Electrical pickups installed in cockpit nose both have applied to pilot and answer to his displaced the control.

Significantly these translations are then amplified and either the force or the displacement signal may be selected as the command to the appropriate control surface serve. Servo lines control control surface.

Design of the 40 gas controls on

RELIEF VALVES



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related directly to the "vertical feed" system.

Other 20 effect signals which are produced by linear and angular velocities and accelerations and which are used in other systems, response and stability characteristics.

Control Inputs

These signals are generated and made available in a variety of instruments, including accelerometers, rate gyros, and altitude gyro and a position-measuring error system.

There are also three miscellaneous error signals, two of which respectively multiply and divide various signals by

dynamic pressure while the third generates a special function of the bank angle.

These are the total number of signals available for each control surface.

• Elevator will respond to any one, or combination, of pilot's elevator command, pitching velocity, pitching acceleration, angle of attack, rate of change of angle of attack, airspeed, bank angle, bank angle rate.

• Auxiliary surface will respond to any one, or combination, of rate of change of dynamic pressure, incremental dynamic pressure divided by dynamic pressure.

• Ailerons will respond to any one, or

combination, of pilot's aileron command, rolling velocity, rolling acceleration, yawing velocity, yawing acceleration, rate of change of angle of sideslip, bank angle, pilot's rudder command.

• Rudder can be made to respond to pilot's rudder command, yawing velocity, yawing acceleration, angle of sideslip, rate of change of angle of sideslip, product of angle of attack and pilot's aileron command, pilot's aileron command.

Record System

Automatic recording system monitors performance and calibration system. In flight, "sampling switch" records one or two parameter push-in of every gun control and feed back to the system which the pilot may use.

Electrostatic automatic control system compares to modernize analog computer. It requires slightly more than two levels of precision power, contains about 150 bit-memories and maintains vacuum tubes.

Plane power requirements are about 710 w at 150 vdc.

Fifteen channels are used in the automatic control system and 18 in the recording system. Entire system requires 430 vdc, improved current distribution with phase sensitive de-modulation.

Long-term position transducer, employed for navigation feedback on each of the six hydraulic servos, is an inductive-type device developed for this system by General Electric. Every control surface position is sensed by a special, zero acceleration and every reference navigation system employs a synchro for position feedback.

Every flight parameter, whether a pressure, an angular velocity or a linear acceleration, is sensed by an instrument employing an inductive pick-off.

Fail-Safe Features

Design incorporates fail-safe features. Controls will automatically disengage system of control surface servo error signals exceed a predetermined value, or if normal or lateral acceleration of the airplane exceeds set limits.

Check valves, connected across interconnections, limit maximum tail loads which automatically controlled surface can produce.

Because of lack of nose space, six-plane system new type of hermetically sealed, nickel-cadmium battery which is installed in engine compartment.

Estimates are the USAF program already proposed for such in flight use will serve years to such completion.

SAC Silver Jubilee Newsreel

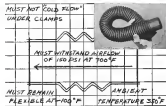
BY JACK PATTER

See America's Top 50 Service Engineers in 50 Years! General Electric's SAC, After WWII, Invented the Industry's First Light-Speed Engine Exchange Program.

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Silicone Products Department, Watford, New York

GE SILICONE IDEAS

Problem: Find a high-temperature sealant that will protect shaft and the crew.

Solution: Mils made with G-E silicone rubber insulation.

Exposed to an 1800°F flame for hours, G-E silicone rubber insulation still functioned, forming an seal of silicone dioxide, an extremely non-conductor. No heat fumes are released, nor will it shrink and expose the wiring, as the laboratory experiment on the left shows. Silicone rubber has superior dielectric strength at high temperatures and longer life for years. It stands up well to oil and high vibration, has low water absorption. It is highly flexible down to -75°F.

Check into the possibilities for silicone rubber seals and gaskets were for a crew's face mask from the cockpit, and much less than other heat-resistant materials. Technical literature and names of qualified firms and sales representatives are available on request.

Problem: Design a flexible duct capable of resisting flames, which will carry air at 700°F.

Solution: Specify G-E Class 700 silicone rubber.

Problems like the one aircraft duct, engine-warming and cabin heating ducts are being successfully solved with General Electric's improved Class 700 silicone rubber. With a service range from -120° to 600°F duct made of G-E Class 700 must prolonged heat at 600°F and can carry air up to 700°F. Tests prove good resistance to constant aircraft fuels and lubricants, including MIL-L-1500. Ducts and duct connectors made from G-E Class 700 silicone rubber exhibit low compression set—will not "hold flow" under change. And with improved flame resistance, Class 700 is proving to be the best material for all flexible hot air duct applications. Special G-E silicone rubbers are available for almost every application. Technical data on request.

Problem: Find a hydraulic fluid that functions over the -100° to 700°F range needed for future aircraft.

Solution: Versilube F-58, General Electric's new silicone fluid, with the best performance over the range of any hydraulic fluid now available.

Over the -100° to 700°F range, only General Electric's new silicone fluid, Versilube F-58, provides adequate performance in all three areas: thermal stability, hydrolytic resistance, temperature coefficient and oxidative stability. Versilube F-58 stands up to 700°F and hydrolytic stability. No other non-water-based hydraulic fluid matches the thermal stability of G-E Versilube F-58—up to 600°F and low water absorption, up to 700°F. Its viscosity is unaffected at temperatures as high as 700°F and compares favorably with other hydraulic fluids in the moderate range. Versilube F-58 also maintains a more desirable constant viscosity than other hydraulic fluids over the -100° to 700°F.

For more information about Versilube F-58 and other G-E silicone fluids, send the coupon below.

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No matter how many missiles a nation builds, no matter how much they cost, the effort is useless if they fail to deliver a warhead accurately on the target. On the other hand, the nation possessing missiles of known precision has one of the greatest powers on earth to prevent wars. No aggressor could afford the costs and deadly retribution such missiles assure.

Whether a missile is designed to intercept a bomber at short range—or demolish a target in another hemisphere—its effectiveness depends to a large extent on the performance of the propulsive, electronic, hydraulic and mechanical systems which guide it. With new missiles capable of reaching 3,000 mph within seconds after blow-off, these ultra-sensitive components must survive violent stresses and hold the missile on its true course to the exact moment of impact.

Through the foresight of America's military strategists our missiles now constitute a strong power in maintaining world peace. Our immunity to attack will continue, however, only so long as their precision and accuracy improve. Sperry's contributions to our missile program range from instrumentation and components through major subsystems like radar and control systems, to complete missile weapon systems and automatic checkout equipment.

SPERRY HYDROSCOPE COMPANY
Great Neck, New York
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SUPER SHIELD is put on blast; nose cone similar to those carried aloft by X-17 vehicle.

Various Missile Test Nose Cones Survive Re-Entry in X-17 Program

Numerous ballistic missile test cones have made successful reentries into the dense atmosphere from a number of hundreds of miles using Lockheed X-17 missile as their vehicle.

Techniques and materials used on these nose cones are still highly classified, but extremely high degree of finish required is evident in photo of a cone similar to those which have been used in trials.

X-17 Record

Shown publicly in recent Andrews AFB, Washington, D. C. air show for first time in conjunction with Air Force Jet's annual convention there, the X-17 has flown successfully in 90% of all launches and has performed 77% perfect recovery of all fragments, according to Maj. Gen. Bernard A. Schriener, head of ARDC's Western Development Division, which oversees the USAF ballistic missile program.

Three-stage test missile is the largest and most powerful vehicle in existence using all solid propellants, Lockheed

states. It is 40 ft tall and Lockheed Chemical Corp. rocket motor. X-17's flight program is as follows:
• First stage is a single motor that blasts the rocket X-17 off its launching pad at an angle and develops thrust equivalent to 500,000 hp. It is a low altitude, head-on motor that burns on the inside (center photo, left) and is fed on itself to provide spin stability. The test vehicle assumes a looping trajectory, coming up to peak altitude at the atmosphere where it drops tail first until air is sufficiently dense to turn it nose down. First stage is ejected and the X-17 begins its crucial work.

• Second stage cluster of three Burnit motors is ignited and in a few seconds develops more than 1.5 million horse power, accelerating the missile through dense atmosphere. Then the second stage is dropped.

• Third stage with four more fins is fired during the X-17's downward at constant velocity, building up its briefly high temperature needed for



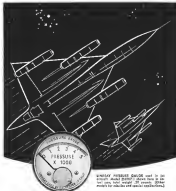
SLIMT NOSE CONE at tip of 48-in. X-17



SPIN MOTOR provides stability of blow



LAUNCH TABLE shows missile properly



EMC-Lindsay Gauge used in jet engine. About 1000 psi shown here is the low end; fuel system 15,000 psi. (Other models for turbine jet engine applications.)

NEW LINDSAY GAUGE

designed for
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The EMC-Lindsay Pressure Gauge for jet aircraft is made for extensive cycling—will stand rigid endurance and over-pressure requirements. Met even the most extreme conditions of shock, vibration or temperature without inaccuracy. Pressure ranges from 1,000 to 15,000 psi.

The EMC-Lindsay Gauge is a Bourdon tube type, using a multiple coil, helical Bourdon tube with the pointer attached directly to the end of the coil. The life of the Lindsay helical Bourdon coil, as compared to the traditional "C" spring Bourdon gauge, is more than 30 times greater and its proof pressure limits are increased by a factor of 3 or 4. The helical Bourdon tube also eliminates the use of linkages and pivots, improving the gauge's shock resistance by a factor of 3 or 4.

The helical Bourdon element is, of course, not a new development. However, the EMC-Lindsay technique in coil, test treatment, coil finish and material specifications are new and exclusive with EMC.

Whether your fuel pressure gauge problems may be, why not let EMC engineering skill provide the answer? Write to either of the below addresses, outlining your particular requirements.

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of the Atmoscosat Secret. The launching vehicle still is undergoing tests.

Assumons said that initial launches probably will be next spring. While prototypes have been tested, the final article has not yet been built because the life of some of the shell material is not good, and Project Vanguard engineers don't want to launch the satellite too far in advance of launches.

Three stage launching vehicle will boost the satellite to a speed of 18,000 mph at its orbit height of 200 miles, where it will orbit for somewhere from two or three weeks to three to six years, according to various estimates. Because of excessive damping, the orbiting satellite will lose approximately one third of its speed every 75 days.

Assumons said the satellite's orbit may range between 200 miles and 1,400 miles from the earth. If the satellite comes within 100 miles of the earth, it will stop orbiting because of the higher density of the air at that altitude.

Assumons said that an error of two degrees during the launch is enough to throw the satellite vehicle off its planned cycle of operation. The launching vehicle will be aimed with a self-destruct device.

Pointing out that it takes 1,000 lb. of vehicle to lift each pound of the 21.5 lb. satellite, Assumons said the launching rocket combination is powerful enough to rise 5,000 miles if fired straight up instead of on an orbital course.

Satellite will be tracked by radio and will have enough power to transmit for from two to three weeks. Assumons said that the satellite will be ejected into the vehicle early in the launching procedure, it will be running out to two days before it is launched.

Satellite's 60 in. thick shell is coated with various materials including gold which are designed to protect the thermal isolation of the instruments inside. Assumons said the satellite is designed to maintain an internal temperature range between zero and 40 degrees Centigrade. The shell will be highly polished and will reflect 85% of the light that falls on it.

Included in the satellite's instruments is a 16 channel telemetry system which is contained on a reel 34 in. in diameter and 1 in. thick.

Talos Handling System

Contract Awarded to GE

Contract for development of a shipboard handling and launching system for Navy's Talos missile was awarded to General Electric's Missile and Ordnance Systems Dept., Portland, Me. The \$5 million contract is GE's first for missile handling system.



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SUB HUNTER!

**How New General Electric Gas Turbines
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Howling winds and a cruel task force and giving it protection against underwater attack is one of the vital jobs being done in our Nation's defense by the versatile Navy Helicopter. It can step in and—er, dunk electronic detection gear, listen for submarines, and then move on, effectively reporting this search mission for hours on end.

To fill the requirements for high performance helicopters that do anti-submarine, rescue, hoisting, and many other jobs, the Navy contracted with General Electric to design and develop a small, but powerful gas turbine engine—the T58. This gas turbine, today, delivers more power per pound of engine weight than any such engine before. Helicopters will be able to fly faster, farther and with greater payload because of this advanced General Electric engineering achievement.

Developments such as this small gas turbine engine are examples of how Armed Services-industry teamwork today is paying off in greater American security for us all. General Electric Co., Lynn, Mass. 01901



UNDERGROUND NIGHT TESTS in a blizzardy 8-38, the new General Electric T58 gas turbine engines today are proving their advanced design. Weighing only 225 pounds, each of these engines can deliver more than 2000 horsepower.

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How long can you rely on any aircraft battery?

SILVER RESISTS CORROSION



Exide silver grid after 1000 hours

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You can rely on your battery only as long as it still has its rated capacity and its grid is still intact. And only the Exide Aviation Battery has these three built-in safeguards to insure long reliability:

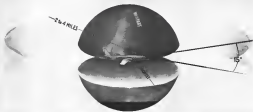
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Remember, you can't see a grid corroding. And when it fails, it gives no warning — might easily cause an embarrassing in-flight delay. Be safe. Install Exide batteries.

They cost no more than batteries that don't give you their protection. Call your nearby Exide office. Or write Exide Industrial Division, The Electric Storage Battery Company, Philadelphia 2, Pa.

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AVIONICS



IMPROVED passive warning radars is expected to provide maximum detection range of 2 to 4 mi. at sea plane altitude plus 500 ft. hemisphere coverage above and below. System proposed by Aerojet-General will undergo flight evaluation this fall.

Infrared to Get Collision Warning Trial

By Philip J. Kline

New York—Aerojet hopes for early test bed from passing air collision threat will be rating in an Aerojet-General infrared proximity warning indicator (PWI) when it begins its evaluation tests in November aboard a company-owned DC-3.

If the tests confirm Aerojet's predictions, airlines probably could start an off-peak self-contained lightweight, moderate-cost proximity warning indicator in their fleets before end of 1958. Unfavorable test results on the other hand, would leave only one remaining hope for a self-contained system—modification of existing weather radar to provide PWI coverage in the forward area.

Weather Radar

Radio Corporation of America analysis of the feasibility of converting weather radar for PWI use appeared at recent Air Transport Association meeting in Los Angeles points out some limitations and operating problems. However, a weather radar (WR) can be able to operate under IFR (instrument) conditions when advanced PWI detection range is sharply reduced. This raises possibility that airlines might be willing to invest in both, providing size, weight and cost is not excessive.

Aerojet's analysis of range and size still leaves little to be believed that the proposed infrared PWI, with its installed weight under 50 lb., could give the

pilot a warning of 20 air advance warning under most, but not all, air conditions, threat conditions.

Typical detection ranges used in Aerojet's analysis are based on its experience with military IR systems for other applications. This makes the analysis appear well-based, but the conclusions

perhaps stretch somewhat which require flight tests. If Aerojet's tests are encouraging, company plans to build a few prototypes for lead engine airlines for trial use early in 1958.

Raytheon, whose West Coast infrared group has shown considerable interest in the air-collision problem, has not yet



MAJOR elements of infrared PWI include 360-deg. azimuth scanner (left), hemisphere coverage detector (right) and 3-in. cockpit indicator to show relative position (center). Only 4-in. diam. of 360-deg. scanner protrudes into windstream. Two hemisphere detectors are required, one mounted above and one below fuselage.



for bigger payloads

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To help meet this demand for better performance from smaller packages, Greenleaf has developed a series of miniature hermetic integrating gyro (model shown is $2\frac{1}{4}" \times 1\frac{1}{2}"$, and weighs just 4½ oz.) and other guidance system components of extremely close tolerances and high reliability.

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weather radar for FWI are shown from the fact that it is a self-contained system and that a large segment of the vehicle itself can, or will be, equipped in the near future. However, a number of modifications and some additional equipment is necessary to enable radar to spot other aircraft, to alert pilot automatically to clearance necessity of continuous watching radar scope, and to prevent undue number of false alarms.

NCA spokesmen told the ATA meeting that with such modifications and additions, weather radar could be expected to detect a medium-size single-engine prop-driven aircraft at distances of about three miles. Effective range would be greater against larger prop-driven aircraft, might be somewhat less against jets under head-on aspect angles. Because of ground clutter, which normally altitude is less than about 15,000 ft, electronic range would be reduced to roughly airplane's altitude above ground.

Limited Coverage

Area of protection afforded by a weather radar FWI would be limited to approximately 220 to 240 deg. in azimuth as forward hemisphere and could not provide rearward coverage unless another antenna were mounted in the tail, adding more weight and complexity.

Vertical coverage also would be more limited than the Army's proposed system. Compared to Army's 15-deg. vertical coverage, a C-band radar with 36-in. antenna would have only a 40 deg. wide beam, or a 7-deg. beam-width with a 72-in. antenna. That, coupled with lack of upper-level beam-



Radar Trainer

Training aid for Delta Air Lines pilots to supplement time on simulator of Collins weather radar, consists of simulated cockpit indicator and motor driven slides which simulate typical cloud formations. Trained, developed by Delta's J. M. Bosley, cost less than \$200.

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Transmissibility below 1 at resonance is an ideal feature in a major advantage of the "Lo" mount. This isolates loadings high-amplitude inputs without loading, even at resonance and at 20" Hz.

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In base-mounted systems, transmissibility of rocking modes under horizontal vibration is so reduced that they are undetectable. This is due to the inherently low rate of horizontal-translational motion plus self-centering horizontal flexion damping.



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For center-of-gravity changes. Independent horizontal damping makes the "Lo" mount especially suited for installation in the plane of center-of-gravity of the equipment.



Convenient characteristics

These exceptional characteristics, resulting from the unique Barry spring and friction-damping design, can be described in terms of the following performance with a wide variety of equipment. Special versions of the "Lo" mount will ensure transmissibility at resonance for a given input, or handle very high-amplitude inputs at resonance without loading.

Physical characteristics

The L44 Mount is available in 7 load designs from 0.25 to 35 lbs. per pound in long- and short-term shock. It meets environmental and vibration requirements of Procedure I, MIL-C-172B. Temperature range is -63 to +250° F. Weight is 6 lbs. each. Write today for Data Sheet 3740.

phase coverage, provide relatively little protection against intrusion from above or below.

Rader now offer one very significant advantage over standard PWTs. With addition of remote potentiometer, user may be able to provide PWTs, under JPK conditions in presence of rain and clouds where reduced or smooth, knockdown (Circulator potentiometer) would be cut out when rain is used for storm warning.

RCA has not yet done up with increasing electronic cost and weight of radar modifications and additions. However, one spokesman predicts that \$5,000 to \$10,000 per airplane would be the price, including a 1.1 ATR one hour, including a 1.1 ATR one hour, including a 1.1 ATR one hour.

If these figures are correct, they suggest that the airlines could have both types of PWT for less than 300 additional pounds (no radar-equipped aircraft) and at a price which might be as low as \$10,000 per airplane. This might not be too steep a price to pay to obtain all possible protection against air collisions.

RCA makes no effort to minimize the limitations of the weather radar PWT. Company is not active in seeking to down up air traffic, but it is willing to provide a modified AVG 10 radar for flight collision of air traffic.

Expansions, Changes In Avionics Industry

Two new West Coast firms, both specializing in avionics, have been formed. Avionics America, Inc., San Diego, Calif., headed by Laurence Mason, will develop and produce electronic equipment including, aircraft communication, Teletype Corporation of America, Los Angeles, headed by William A. Cook, will occupy radio communication and navigation fields with special emphasis on aircraft/aircraft telemetry.

Other recently announced expansions and changes in the avionics industry include:

- Collins Radio will contract new \$2.75 million, 215,000 sq. ft. manufacturing facility in Cedar Rapids, Ia., from its expanding laboratory. Occupancy is scheduled for early 1970 and will give company a total of more than 1,400,000 sq. ft. of plant in Cedar Rapids.

- Nordek-Ketter Corp. has located the South American Division of Pico in manufacturing and sell its avionics and avionics in France.

- Electronic Associates, Inc., Long Beach, N. J., has opened at European Communications, Inc., in Brussels, Belgium at Rue de la Science 41. New facility, called Red of its line in Europe.

will provide analog computation services on analog basis.

- Overhead Engineering Labs, Inc., Albuquerque, N. M., manufacturer of transducers, has merged with Strom-Prank Co., Houston, Texas, a manufacturing-overhauling operation. It will continue operations at present locations.

- Diamond Antenna & Microwave Corp., Woburn, Mass., has taken an additional \$200 sq. ft. of facility in present building and has constructed new 1,200 sq. ft. antenna pattern test range.

- Circule Research Corp., Los Gatos, Calif., component and electronic tube sales, will merge with International Glass Corp., Culver City, Calif., whose electronic division (Lewin and Kraft, Inc.) in Los Gatos was manufacturing power tubes, providing stockholders of both companies appear.

- Polyscope Engineering Co., Inc., has opened new American Center for Analog Computing at 127 Clarendon St., Boston, to provide analog computation services to companies on a rental basis.
- Westinghouse Electric Corp. has opened new specialty transformer plant at 1627 Hollywood Ave., Los Angeles (Parker) includes design engineering facilities.

- Radisson, Inc., Melbourne, Fla., will manufacture and will distribute recent test equipment in the U.S. 10 years becoming associated with Avionics Telephone Co. & Electronic Co., Ltd. of England.

- Obsolete Manufacturing Co., Austin, TX, will build 40,000 sq. ft. addition to its present plant.

- Deane Radio Ltd., of England and Compensate Electronic Transducers-Systems Ltd., London, have agreed to pool their efforts in producing radio equipment for NATO air defense systems.

- Rhema Manufacturing Co. and Solovay Electronics Corp. Ltd., of England will collaborate in their electronic activities as result of successful agreement.

- Hengeler Inc., San Diego, manufacturer of electro-mechanical instruments, has opened new system unit and service office in the administrative building of the North Platte, Neb. part, Curt and John and John and John.
- Electronic division of Boregon Corp. has moved Los Angeles (Lewin and Kraft) office to 230 N. Lake Ave., Pasadena, Calif.

- Gebro Industries, Inc., Miramar, N. J., purchased CG Electronics Corp., Chicago, N. M., maker of radio control equipment. New acquisition which will operate as a wholly owned subsidiary, will retain its corporate name.
- Bessco Engineering Corp., Indianapolis, purchased Electronic South Corp.,



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- Columbus, Ind., maker of memory modules and time cycle controllers.
- **Assembly Products, Inc.**, will double its San Francisco division's relay count, adding facility located near Palo Alto, Calif.
 - **Russell & Co., Inc.**, maker of recorders and meters, moved from Yonkers, N. Y., to 11,000 sq. ft. facility in Palisades Manor, N. Y.
 - **Sperry Products Co.**, division of Sperry Rand Corp., opened new 11,000 sq. ft. facility for production of flight control systems in Phoenix, Ariz. Plant is composed of 110 is expected to reach 500 by mid-1955.
 - **U S Semiconductor Products, Inc.**,

opened second facility still plant in Phoenix, Ariz., at 5015 Osborn Road (local production will be low-power silicon diodes).

- **Cadillac Radio Co.** formed new System division to expand its activities as successive and repair communications systems. John D. Nequist has been named executive director of new division. Frank C. Davis is division's general manager in Dallas and Richard M. Ruggen holds similar position at Dallas' Cedar Rapids branch.
- **Electronic Communications, Inc.** (formerly Air Associates), organized its liability insurance section to be headed by C. Wendell Cox.

FILTER CENTER

- **Advances at High Speeds—Mach's Acoustics Phenomena of Electronic Ingot**, a title of paper by Donald Berthold of Lockheed's Mach's Section division scheduled for presentation at Western (San Francisco, Aug. 28-29) in session devoted to problems of interest in high speed flight. Here are some of the other papers with interesting titles slated for presentation at Western.
 - **Information Theory in the USSR**, by Paul Gross, Lincoln Laboratory.
 - **The "Newer-A" Semiconductor Negative Resistance Device**, by Robert G. Fohl, The Radio Corp.
 - **Micro-wave Atomic Amplifiers and Oscillators**, by George Brubaker, Hughes Research Laboratories.
- Western sessions on military requirements in basic and applied electronics research will include following topics:
- on James M. Redger, Office of Assistant Secretary of Defense, L. O. 10-104, Ingenuity of Air Force Cambridge Research Center, Houston J. Merrill of Army Signal Engineering Laboratory, and Arnold Shoroff, Office of Naval Research.

- **Electronic Ingot—Daystrom, Inc.**, will shortly announce formation of Daystrom Associates Group, a federation of five divisions intended to strengthen company's bid for space weapons systems and sub-orbital contracts.

- **SAS to Test C858—Scandinavia** on Automatic system reportedly will outfit a Koka compatible single channel (C858) equipment in Europe to civil use in various performance.

- **Witchamite X-17 Ingot—Scandinavia** on Automatic indicator used in Lockheed X-17 ballistic missile reportedly was still in operating condition when dug up from under 12 ft. of soil after landing report had been made. The device, which uses semiconductor tubes and transistors, without support forces of 1,000 Gs, Lockheed estimates.

- **Transducer Four Out—General Electric** has started price of its high frequency precision probe transducer to be \$2 to 75¢. Price also apply to types 1N29, 1N30 and 1N31.

- **Saidlight No Problem—Bendix** Radio's bright tube radio indicator, designed for easy viewing despite high surface envelope light, is reported to be ready for initial evaluation here this week. New indicator will be electrically interchangeable with present weather radio scope, will measure only 1 1/2 inches high. RCA this is developing bright display for its radio radio.



Putting the screws on a tornado

The expensive wind tunnel under construction at Tufts College, Tufts, contains some of the most gigantic construction with some of the most precise electronic controls in the whole history of aircraft testing.

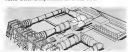
The project simulates conditions of flight in excess of 35 miles altitude, from Mach 1.5 to approximately Mach 4.5. Some of the statistics of design are staggering, even in today's world of wonders.

The nozzle walls of the tunnel are solid steel, 100 feet long, 16 feet high. To reach any one of 500 master positions, these plates are moved by 66 huge screw jacks on each side—with a tolerance for error restricted to 8 one-thousandths of an inch in an 8-foot stroke! Each jack "buys back" electronically to Master Control, reporting its position. Provision is made for remote plotting and operation by magnetic tape programming, set up in advance.

Two associated companies are doing this job—the Electric Boat and Stromberg Carlson divisions of General Dynamics Corporation Electric Boat—

builders of the atomic-powered submarines, Nautilus, Scorpion and Skate—has overall responsibility, will supply the jacks and design the servo mechanisms. Stromberg-Carlson is to create and build the digital computer system for the electronic controls.

This project—combining heavy, precision, accurate "machinery" with electronic splashes of a complex, automated nature—is typical of the services which General Dynamics divisions offer.



Sketch of the project, being built by the U. S. Army Experimental Corps, Arnold Engineering Development Center. Ground area locates the actual walls and nozzle.

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WHAT'S NEW

Publications Received:

Rockets, Missiles, and Space—by Charles Condon—Pub. Wiley: Macmillan & Company, Inc., 425 Fourth Ave., New York 16, New York, \$1.75, 256 pp.

A broad survey of the government's program to launch unmanned, earth-orbiting satellites. Accounts based on accurate research of civilian and government experts.

Guided Weapons—by Eric Berggren—Pub. The Macmillan Company, 68 Fifth Ave., New York 11, New York, \$5.00, 255 pp.

Explains the principles of the present problems concerned with missiles. It also describes each type of missile according to its use, ground-to-air missiles, air-launched missiles, and ground-to-ground missiles.

Research and Development—by Aaron L. Goldstein, et al.—Management, 121 East 56th Street, New York 16, New York, \$12.00, 91 pp.

The meaning and evolution of research and development in the corporate firm. It also outlines the basic theory and practice of the management audit.

The Sound of Wings—by Joseph B. Roberts and Paul E. L. and—Pub. Horvath Black and Company, 534 Madison Ave., New York 17, New York, \$5.00, 345 pp.

An anthology of aviation literature dealing with the experience of flight, and tracing its history from man's first dream of being airborne to his open reach with the rocket.

Rockets, Missiles, and Space Travel—by Willy Ley—Pub. The Viking Press, Inc., 125 Madison Ave., New York 17, New York, \$6.75, 324 pp.

The story of rocket development and operational progress. This is a revised edition from when it was first published in 1944.

Radio Operator's License Q & A Manual—by Milton Kaufman—Pub. John F. Rider Publisher Inc., 716 West 146th Street, New York 16, New York, \$6.00, 720 pp.

The 26th Edition contains all the latest question revisions, renumbering and deletions as made by the Federal Communications Commission.

Modern Altimetry—by Noel D. Van Sickle, Colonel, USAF—Pub. D. Van Nostrand Company, Inc., 120 Alexander St., Princeton, New Jersey, \$9.75, 362 pp.

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An A. B. C. of Aeronautics—by L. L. Beal—Fols Publishing Company, 2 West 43rd Street, New York 36, New York. \$3.95. 111 pp.

A dictionary designed to provide the student and enthusiast with a complete reference guide to all the terms they are likely to meet from elementary descriptions to highly technical details.

Reports Available:

The following reports were sponsored by Office of Technical Services, United States Department of Commerce:
Packaging and Materials Handling, 1941-57—115 technical reports. \$10 (C78-72)

Microscopic Stopped Ionics—Larsberg, Lemons—by G. D. M. Pickett and H. F. Coleman, Naval Research Laboratory, and M. C. Wolf, and W. R. Cerny, Lincoln and Company Inc. \$75. 71 pp. (P. B. 121561)

Chemical Surface Treatment of Titanium—by H. A. Pao, P. D. Miller, and R. A. Jeffers, Battelle Memorial Institute for Atomic and Ordnance Studies. \$1.25. 45 pp. (P. B. 121665)

Research and Development for the Welding of Titanium and Titanium Alloys. Final report—by J. J. Clyne and I. Katschinski, A. S. Smith Corporation Int. U. S. Army Ordnance. \$2.00. 70 pp. (P. B. 121549)

Investigation of Deformation and Fracture of Metals—by R. F. Coker, Jr., R. W. Gould, and R. B. Leiber, General Electric Research Laboratory for Weight Air Development Center. \$75. 25 pp. (P. B. 121585)

Survey of Low Alloy Aircraft Steels Heat-Treated to High Strength Levels. Part 1—Thermodynamic Equilibrium—by G. Seitz and W. Beck, Southwest Research Institute for Weight Air Development Center. \$2.50. 96 pp. (P. B. 121708)

The Effect of Vibration in Control Display Ratio During Training on Transfer to a "High" Ratio—by M. B. Ruckman, Wright Air Development Center. \$50. 16 pp. (P. B. 121316)

The Effect of Target Velocity and The Area of Exposure Changes Upon Performance in a Two Dimensional Compressor Tracking Task—by J. C. McGinnis, Washington University for Weight Air Development Center. \$1.00. 38 pp. (P. B. 121360)

AVIATION WEEK, August 12, 1957

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for coating on the superstrong shank was also, future Galton shafts will include coatings for magnesium, titanium and beryllium. Also, because the coating may prove too thin to guarantee constant in use, Galton will attempt to develop a special coating for bulk of salt water based superalloy flying boats.

Surplus Milling Units Made Into Duplicators

Los Angeles—Contractors of World War II surplus single purpose Cincinnati Milacron machines to general purpose Turner Control Duplicators by Urby Metal Products Inc. of Pasadena has produced a potential saving of \$50 million according to the chief of the Air Procurement District here.

The machine's specific milling machines were manufactured especially in cost saving lines on cylinder barrels of metal engines and are no longer needed for that purpose. There are 125 of them stored in USAP warehouses. Five of the machines have been loaned to Urby Metal Products for conversion purposes and two already have been converted.

Duplicators are already needed for Air Force production of aircraft parts in such models as the F-108, F-102, F-106, B-58, B-52, and KC-135 as well as its engine and engine programs. They must be capable of machining to close tolerances with hard metals in titanium, chrome, molybdenum, Hastelloy, Duclay, Inconel and Met-N. The specialized machines must then require much.

New duplicating machines cost about \$60,000 apiece and with the highest speeds, can only be had after a production lead time of as much as 24 months.

USAP cash advantages from the conversion will amount to:

- Storage cost savings
- Rental savings to contractors of \$1,000 per unit per machine
- Parts production savings of about \$4,000 per month
- Cost of conversion is about \$19,000 each.

All rights and drawings of the converted machines revert to the Air Force for the use of other defense contractors as the machines were loaned to Urby Metal Products and the company has no proprietary interest in the conversion.

Fairchild Will Develop Surveillance Drone

A \$12 million research and development contract has been awarded Fairchild Aircraft Division for work on a high speed surveillance drone for the Army Signal Corps.

Flexflyte gives you unsurpassed efficiency on the tightest turns



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Makes possible a wide variety of circuit combinations
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Reduces arcing, prolongs switch life, increases electrical safety and prevents unusual applications
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Saves weight and space, allows more compact designs.

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DOUBLE-POLE
D8 SWITCH**

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Control Four Circuits with ONE Snap



Used to control circuit breakers or to switch other circuits, D1 snap off test pilot lights. D1 snap plus circuit to control handover working power. D1 snap minus to control handover power. D1 snap plus to control handover power. D1 snap minus to control handover power.

Wipe Movable Poles in Series to Switch High Current or High Voltage



As proof of switch action, you can connect the two movable poles in series to control two circuits. For high current applications, you can connect the two movable poles in series to control two circuits. For high voltage applications, you can connect the two movable poles in series to control two circuits.

Equip with Actuator



Each switch assembly is set off by a panel assembly or by a long series of switches in a rack. Each switch assembly is set off by a panel assembly or by a long series of switches in a rack. Each switch assembly is set off by a panel assembly or by a long series of switches in a rack.

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- Miniature Switch
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PRODUCTION BRIEFING

Jet engine fasteners can be instantly tightened by this small platform after which sets in a combined glass plate and control. Made by Charles Engelhard, Inc., East Newark, N. J., the 14



in long device is being used in the F4U-785 turboprop engine in the first production U-2. Engelhard and that seven U-2 jet engine fasteners are considered its product.

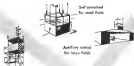
Lewis, Inc., Control, Ltd., is a newly formed company which plans to specialize in structural and other types of structural fasteners for aircraft and missiles.

Robertson-Falco Controls Co. will move its executive offices from Greenburg, Pa., to Richmond, Va., in mid fall. Move will bring the company into closer contact with government defense agencies and provide a more central location to the company's main plants in Midland, Conn., Philadelphia, and Knoxville, Tenn.

Mechanical variable speed transmission in Cleveland Worn & Gear Co., Cleveland, Ohio, uses Ferguson shafts to vary speed smoothly between the input and output shafts. Based upon a three-revolution, imperially developed



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SS White Industrial Division, Dept. E, 40 West 42nd St., New York 18, N.Y. Western Office: 1829 West Pine Street, Los Angeles 46, Calif.

for variable pitch aircraft propellers. Cleveland's industrial drive is especially interesting in view of the current efforts to produce mechanical variable speed alternator drives (AW Aug. 8, p. 57). The Cleveland "Speed Visitor" provides ratios up to 9:1 and output is now rated up to 16 hp.

Thermocouple for jet engine afterburners, developed by the Thermo Electric Co., Solihull, Birmingham, N. J., uses a novel protecting cover. The design effective for this probe is five times that of 50081. So far it has been tested at 2,750° for 14 hr in a Corbin Wright J67 afterburner. Combustion support tube and radiation shield cover is made from titanium oxide. Platinum-rhodium thermocouple wire construction is used for 3,000-1,500° temperatures and reduces chromium dioxide which are



used for 3,000-4,000° temperatures. Since no oxidation coating is used, the chromalum conductor runs from the source air stream. However, the nearest temperatures at the combustion end must be kept below 580°F. While the first relatively short-lived units will be used for engine tests, it is possible that later longer-lived units could provide improved engine controls through temperature feed-back from the hottest parts of turbine engines.

Pacific Optical Corp., Inglewood, Calif., markets among its present products the first microfilm aerial photographic reconnaissance of night aerial infrared light levels and the 10th version of complete Schlieren optics for the study of shock patterns in wind tunnels. Pacific's new 16,000 sq ft plant is equipped to produce optical parts up to 16 in. diameter when end usage can vary from infrared to visible spectrum.

Robert L. Wells and J. Rodgers Magnus have formed a new company, borrowing their names to operate in training aids, technical models, flight simulators and to provide design services for the aircraft industry. Both men were for many years with Barnes Rodgers Technical Training Aids Co., Cincinnati, Ohio.



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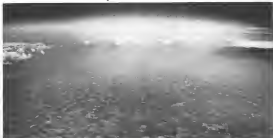
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DELTA PHOTO taken by Fairchild CAX-12 from over 40,000 ft, is the widest shore coverage of wide, high altitude photos.

How F8U-1P Photographed U.S. at M 1.1

By George L. Claflin

New York—Six aerial cameras—three CAN-11s, two K-17s and a P-1 trained with automatic inverse camera control system NCCS-4 (Navy Camera Control System No. 4)—made the most advanced photographic support series during the record-breaking flight of a Chance Vought F8U-1P.

The photographic Crusader version was flown from California to New York in 5 hr. 23 min. 5.15 sec. by Maj John Glavin, Jr., USMC (AW Feb. 22, p. 10).

Five cameras, the three CAX-11s and two K-17s, were made by Fairchild Camera and Instrument Corp. The CAN-11s (AW Nov. 21, 1956 p. 107) are the latest, crosshatched image

Motion Compensation (MCP) cameras to be developed by Fairchild.

NCCS-4 (AW Nov. 21, 1955, p. 34) is the most advanced camera control system installed in an operational aircraft according to Chicago Aerial Industries, which designed and manufactured the equipment.

P-1 camera is an anastigmat type designed for forward firing position and primarily for strike damage assessment. Camera was developed for the Air Force five years ago and has since been produced in many models for USAF and Navy by J. A. Mueser, Inc.

Photographic Details

Details of the photographic aspect of the F8U-1P's record coast-to-coast flight given to Aviation Week by Commander Ed. Alston, director of Aeronautical Photography, Experimental Laboratory, Naval Air Development Center, Johnsville, Pa., and assistant director Lt. Grade J. Condens. The laboratory was responsible for operation of the F8U-1P's photographic equipment during the trip.

The plane's transcontinental dash was its first spontaneous photographic flight; it had previously made only short test flights to check out its 600 lb. of photographic equipment prior to the record run.

Taken assigned to the camera were: •CAX-12. Compensation record from takeoff to touchdown. Taking of the still pictures was timed automatically.



PHOTO COMPARTMENT of record-breaking F8U-1P shows complex wiring, port oblique CAX-12 camera (center), vertical CAX-12 (lower right). Note glass window in open panel.



VERTICAL reconnaissance photo taken from 30,000 ft at maximum speed shows Trenton, N. J. (upper center); Meriville, Pa., near Delaware River (left). Newly created Furlow dam works lies in ribbon of river at lower left.

to give a 20% overlap of one shot on another. At cruise altitudes of 15,000 to 20,000 ft average time interval between exposures was 75 sec. Shutter speed was usually 1/200th of a sec. The three cameras were mounted in a transverse, staggered—then across. The port and starboard oblique cameras covered the film plane at 60 deg from the horizontal. Middle camera was mounted vertically. The 300 ft roll of 78 mm film supplied each camera was ample for the 31 hour flight since about 400 ft in square shots can be taken on this length of film.

•K17: Two K17's were mounted side by side in the rear camera compartment. The cameras gave complete take off to landing vertical coverage. Their cameras operated from California to Gordon City, Kan. There May Glenn started second camera and shot off the first. Second camera photographed strip from Gordon City to New York. Frames were taken with 50% overlap. Magnesium held 400 ft of 9 in film.

•P2: The single P2 unit was mounted pointing forward and down at an angle 15 deg. from the horizontal. The camera was operated as well by the pilot through a trigger switch on the control column. Capacity of the camera's magazine was 50 ft of 78 mm film. Magnesium with 15 ft and 100 ft capacities are available.

Forward Blanking

CAN 12 and K17 cameras were triggered with IMC responses. They are moved automatically during the exposure in the appropriate direction and at the correct speed to prevent

blurring the exposure because of the plane's turn. Forward blanking ground speed is precisely measured in a Chicago Aerial Industries' beamless sensor, which, through electronic controls, continuously measures the lag sense to ground speed to prevent blurring. Variations of light and dark, as the ground are detected by the sensor to set IMC system in operation.

CAN 12 cameras are less than one fourth the size of standard cameras according to Frenchell, yet have a faster cycle speed. Camera can snap pictures at plane speeds ranging from very slow to supersonic and from low to very high altitudes. Four different film cranes are provided, 36, 5, 6, and 12 in. Speed was CAN 12s and 16 in. focal length lenses. Camera is now in production.

Control Refinements

Chicago Aerial Industries says that the NDC-4A is the first complete camera control system designed to meet 500 cps vibration requirements. At the same time, weight was decreased and rigidity, vital to optical accuracy, was maintained. Earlier systems were designed to withstand 35 cps.

New vibration concepts reduced cockpit display area requirements by approximately 50% and simplified camera operation.

Vanderler designated VP-55, serves to locate targets optically and double as a precision air optional aid. It gives the pilot drift angle and provides a means for determining true air speed. A moving grid line, the pilot pictures an independent check on the IMC unit.



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Nuclear Propulsion Specialist. To main studies producing state of the art evaluation and recommendations ultimately resulting in design of aircraft nuclear propulsion systems. Requires advanced degree and 2 years related experience.

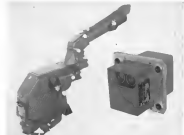
Propulsion Performance Engineer. Must be capable of analytical airplane installed performance determination with varying inlet and exit conditions. Requires minimum of 3 years experience in jet engine cycle analysis. Advanced degree preferred.

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CHICAGO AERIAL INDUSTRIES' VP-55 forward blanking (left) is shock-mounted. Company's beamless sensor (right) controls Image Motion Compensation. They are not to scale.



The propulsion engineer who was allergic to switches

During the Vought Crusader's N.A.A. record-breaking flight across the continent, fuel management was a vital factor. But it wasn't the constant worry it might have been. Fred Alvin had seen to that, beginning four years ago.

When the Crusader project was born, Fred was just a few years out of Alabama Poly. He was still a new face. Mostly new, Fred would have agreed when he was tapped to develop the functional design of the Crusader fuel system.

Every spot told Fred his system should be reliable and very lightweight. Plus, too, gave him a special request. In the ready room near the flight line they described the constant no-flight situations required by complex fuel systems. "Can you fix it so we can forget fuel for a minute?" they asked the young designer. "Can you sit down on those switches?"

Fred went almost for simplicity, plunging into a three-month whirl of schematics. He was encouraged by close design group assistance to studies and byrons. Soon he was making procurement schedules and writing functional reports. Then, with the fuel system madcap, Fred carried what he'd done.

It was a shapeliness of simplicity, Alvin was the usual complex CG control system. Fred had bypassed

the problem entirely by using shrouding of fuel cell locations and fuel line crossovers. Alvin, too, was an emergency system—altogether with the need for it. There was a unique air transfer system for moving fuel from the Crusader wing tank to the main ramp, plus some brightly conceived lesser features.

At madcap and flight tests proved, Fred's ideas more than met weight and reliability requirements. And, as pilots were shown, all discrepancies forecast had already in the cockpit. There Fred had won his war against switches.

Only one had survived.

At Vought, the invitation to find a fresh approach is extended in every department, theory, in groups that coordinate the design and development progress, and in test facilities that can evaluate the most advanced proposals, often reverse the attention they deserve.

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FAIRCHILD automatic exposure control unit sets CAK 12 camera aperture lens opening to light intensity. If lens is full open device slows shutter speed for correct exposure.

into to determine the proper internal size for photographic coverage.

VI 15 combines two separate optical systems for narrow and wide angle views of the terrain. In the FBU-1P, the narrow angle system is forward looking because the plane is so fast that the pilot does not have time to select targets through a vertical narrow angle system.

Another innovation, according to the Chicago company, is a single wide angle rear pupil replacing two smaller ones previously used.

It doubles light transmission, making it easier for the pilot to select targets under dawn, dusk or other dim and light conditions thus increasing the system's photo reconnaissance capabilities.

Greater Freedom

Use of a single, large rear pupil also gives the pilot greater freedom. It allows him to move his head over front the area previously permissible without disturbing or losing transmitter contact too.

This simplifies the pilot's job of flying without any losing track of his photographic objectives.

CAI increased the night capabilities of the NCOS-4 system with night separated mode of operation. Operation in darkness thus not lose optical effectiveness.

While one camera makes an exposure, the other receives. Thus the exposure rate is doubled that of single night systems and clear pictures can be obtained at more the speed or three half the altitude.

Cheser Yeaghr's FBU-1P is an example of how a camera control system can be integrated into a vehicle. CAI and Cheser Yeaghr engineers converted the FBU-1P for reconnaissance without adding a special nose. The only changes were dictated by the need for specially flat windows in the belly. The bulge on top of the fuselage was added by application of the new side to maintain speed performance.



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Harder Hitting 30 mm. Vulcan Weighs About Same as 20 mm.

The 20 mm T170 Vulcan is now being used on USAF's supersonic Lockheed F-104 Starfighter.

Flying Tiger DC-6A, which recently made a belly landing at the mouth of Jamaica Bay after experiencing a power loss on all four engines, shortly after taking off from New York International Airport has been successfully salvaged.

A hundred foot long barge was towed to a few yards of the aircraft through a specially designed channel, then sunk beside the plane.

A sand ramp was built between plane and large Aircraft, which had been jacked up, had its landing gear lowered and was towed onto the large by a skidway derrick. Water was poured

Name of the case passengers and case obtained was removed.

Flying Tiger awarded a contract for repair of the airplane to Lockheed Aircraft Service International at the New York airport. This includes changing the four engines, replacement of belly door and main landing gear, nose gear and main cabin door, replacement of

and reduced repair, is associated with fatigue and therefore clearance of the airway.

*Used as a static display, or as classroom instruction, the 587 display measures 48 in. long, 45 in. wide and 18 in. high. It is designed to redistribute pilots on cockpit radio aids, waypoints, GCA patterns, ILS paths and updates and commercial articles under the command of Norfolk control area.

A photographic enlargement of a standard Northolt area measurement chart is mounted beneath the display. Six stars are presented in colored plastic and conform with the appropriate color designations used on the chart: green, amber, and blue. They are installed at the 700 ft level. Radio range comes at intervals: Newport and the



markers are shown in clear plastic of appropriate shape. The Cofield Dens-Rite® chains and Victor arrows are represented by 1/4-in diameter clear plastic rods. Special flight patterns are included to illustrate the Navy Norfolk standard holding pattern, CCA approach, and jet acceleration pattern.

The display represents altitudes up from sea to 10,000 ft, is lighted on altitudes, contains model aircraft to represent air traffic. The display was designed and manufactured by the Naval Training Device Center, Sand Point, N.Y.

Electrical generating and control systems for USAF's supersonic B-58 Blustar are being built by Westinghouse.

Electric Corp.'s Aircraft Equipment Dept., Lima, O. States, made up of three completely enclosed 40 in. generators, use Westinghouse-developed silicone sealers that rotate with an e-c rotor to provide a constant purpose is to eliminate conventional carbon brushes which break down rapidly at high altitudes.



Hold H 210 using a new drive system has completed a 1,000-h accelerated ground endurance test at Volvo's Palo Alto Calif. plant. Delivery of the H 210, but designed to meet an Army requirement for 1,000-h interval between overhauls, will begin this fall. A three-place helicopter powered by a Lycoming VO 435 engine developing 210 hp, H 210 will be used for training utility missions.

Following is a list of unclassified contracts for \$25,000 and over as received by Air Force Contracting Officers:

For more information on the following products, call 1-800-451-7822.

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Marlin Co.'s plant at Orlando, Fla., first privately owned and financed major water facility in the U.S. under Army engineers is moving completion on a 7,000-acre site. Plant, scheduled for completion late this year, will treat out Lake Okechobee water. Bulging in to surface waste, and Microbiolaster, control system for waste AA bottles. Plant contains 800,000 sq ft of space.

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BUSINESS FLYING



CESSNA T-37A at Randolph Air Base, Ga., on Feb. 1987 assigned to a primary training contract school. New T-37As are with Project Pulse, which was transferred from Grumman VFS to handle Phase VIII evolution of the T-37 at Randolph.

Contract School Evaluates Cessna T-37

By Ernie J. Bellus

Randolph, Ga.—First phase of evaluation project under contract Cessna T-37A is this field is underway at Southern Army School, of USAF's seven independent contract pilot program training facilities, plans to replace the 100th Airborne Assault Division (North American T-28A) at each school.

Southern Army School is this field school to receive the T-37A under a contract negotiated with Air Materiel Command, which Project Pulse, installed in, and replacement evaluation of the project, was transferred from Third Training Air Force Headquarters, Contract AFM Waco, Tex. Randolph is base in handling Phase VIII of the T-37A program, cost comparison and suitability.

Experimental Class

An experimental class, 50-N consists of 20 students who had completed 10 hr of training in the primary powered Beech T-34A, are now taking their final primary training phase in the T-37A. This consists of 25 hr of academics and 150 hr of flying. This class, composed of above-average, average and below average students, will graduate in March.

Southern Army School officials go to behind training and preliminary flight test experience to establish, but indications are that both maintenance and operational figures will be under due to the T-37A.

to be used by all of the contract schools for T-37A training.

Among the aircraft sought are those:

- **Optimum number of student flying hours in the T-37A.** The 150 hr being given class 50-N is an arbitrary figure for evaluation, indications are it will be adjusted downward. Normal flight time on the T-37A, which the T-37A is scheduled to replace is 100 hr.

- **Logistics support needed by a school to keep the T-37A flying, from ground equipment to parts and belts.** Project Pulse gets T-37A airborne support from T-37A AFM and engine requirements are furnished by depot at San Antonio.

An initial indication of how the T-37A compares additional facilities in the extra fuel storage, Randolph AFM is planning. It is currently using a 30,000 gal. surplus facility to support the program, scheduled is a 450,000 gal. above ground tank for J-4, for which contract has already been let, according to the school's general manager, Hugh Davis.

- **Maintenance procedures and evolved schedules on the status of aircraft engine and equipment (new) Periodic check on the T-37A takes about 17 hr and this will probably go down in the learning curve of ground personnel going up, the same checks on the parent T-34A takes about 40 hr.** Cost figures will take experience to establish, but indications are that both maintenance and operational figures will be under due to the T-37A.

Procedures and schedules get parties fully complicated when it is known based that both engine and engine are new and are still undergoing modification as a result of past and current evolution T-37A operation is especially, which damaged engine planes are being flown by experienced students. Indications are that flying the airplane is no problem and that they had then could turn students loose in a few hours, the only drawback being that they want to ensure that students are thoroughly familiar with the cockpit and emergency procedures.

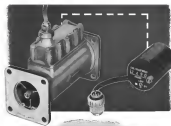
Early Sale

Southern school in first Class 50-N student, 2nd Lt. James A. Rags, Jr., Rockwell Work, after only 7 hr 10 min dual time.

The school has a 5118-100 Luf. 8M 2 engine, equipped for T-37A. Now accepting since 25 hr x 24 hr, electronic checkout are being scheduled to take 11 hr x 17 H use.

The school has nine T-37As for student training, another three are used to upgrade contractors who get some 16 hr before firing students, making on a profit center basis. Then in that they think this could also after the second is third check ride.

Current utilization of the new T-37As used by the students is about 60%. Turnaround time on the airplane is faster than the T-34A, even at these early stages and ground personnel like



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Buddy-system in-flight refueling means greatly increased range and striking ability for carrier-based aircraft. The Reverse Flowmeter System, used in this new method of mid-air refueling and now being produced for two Navy prime contractors, totalizes flow accurately and dependably without the use of "black boxes" or vacuum tubes.

The output signal of the transmitter, shown above, is fed directly into the electrical counter, eliminating the need for external electronic amplification.

Various impulse-flow rates, flow rates to suit your totalizing applications. Rate of flow indication also available.

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the arguable advantage. One barman told *American Week*, he has yet to hear an instructor criticize the airplane.

Not that all the problems are solved. For example, the 525 B, Great Coast model built 169 T-9 instructors are still 55 to capacity, although at all accounts one engine had about 140 hrs on it. Among the still critical items, outer basket seats go beyond the 16 hr recirculate check, as does the exhaust effluent—cracking is the problem. Con solvable aircraft is under way in various attempts to combat the problem.

Buts are another subject for an satisfactory repair, both existing and future. Problems lie in both the Great East & Rubber Carbide Industries themselves and the nation. Southern Airways pointed out that they think that the material used in the tanks does not degrade fast enough, although the tanks themselves were designed to USAF specifications.

Among the modifications in the works at Great is a project to delete the exhaust defective system, used as an approach to maintain back engine rpm and reduce thrust, and replace them with larger, more effective wing tips. This will reduce maintenance. General is also planning to revise the wing gear, providing a runway level to make landing easier. Current long wheel requires excessive effort in some ground maneuvering angles, per manual feel.

There is also concern about the short range of the radio gear (AWA, 3 p. 17) operation, as to whether this is due to antenna configuration or the radio requiring individual adjustment to get peak performance.

PRIVATE LINES

Great's third quarter sales totalled \$19,665,800, a gain of 9% over the previous quarter, net profits showed a higher gain being \$1,446,631 after tax compared to \$912,295 in the second quarter. Sales volume for the nine months ending June 30 was \$40,968,400 with net earnings being \$2,648,100. President David Walker comments that quarter sales at \$19.7 and has brought the company's total sales for 1957 about five percent higher than last year.

Contract of over \$12 million to overhaul Lockheed F-80 jet fighters has been awarded by American Engineering & Manufacturing Co., Golden, Calif.

Chance Vought is one of the latest of the large prime military plane contractors to become interested in bus-

roll it out...

hook it up...

turn it on...

In little more than the time it takes you to read this ad, the Herman Nelson MC-1 portable heater is connected to the Convair F-102A's own ventilating system, turned on and already sending volumes of heated or ventilating air where needed for a quick and proper pre-flight... another example of the leadership of Herman Nelson Products.

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This new Rohr Assembly Plant was recently completed at Auburn, Washington. It will facilitate final assembly and delivery of Rohr Jet Power Packages and other components for the Boeing KC-135 Stratotanker (above) and the Boeing 707 Stratotanker. This new, modern location is

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new aircraft field. Company has been conducting market survey and collecting pilot operators for possible design studies.

If \$ 5 report of aircraft weighing 6,000 lb. or less during May totaled 138 units valued at \$8,670,988, an increase of 45% over Mar 1976 in units and 45% in dollar value. During first five months of 1977, month-day month aircraft totaled 562 planes valued at \$8,125,945 compared to 391 planes shipped in the same period last year with a value of \$8,664,237.

First in revenue classified figures for Pacific Aerospace Corp., Berkeley, Calif., indicate a net profit of \$441,145 after taxes compared with \$361,285 in the same period last year. Canada duty sales for PAC and subsidiaries in 1975's first half totaled \$16,716,181 compared with \$1,578,451 in the first six months of 1976. PAC is expanding to increase diversification of efforts along civil aviation lines, anticipating increased competition for reduced Defense Dept. Fiscal Year 1978 funds allocated for aircraft maintenance.

Prototype Monocouliner MS-700 four transport aircraft executive plane is being shipped to South America to be displayed at the Lima, Peru, fair and to undergo flight demonstration.

Transair Aviation, Ltd., Montreal businessplane service operator, is now local distributor for Eastern Canada, Dallas Aeromarine, Ltd., named Vancouver to exclusive Canadian distributor.

First export order for Westland Whirlwind four-place utility helicopter covers two units for use by monthly forward Baseline. Naval Aerospace Dept.

Deliver for new Edgar Power R.P. 9 utility aircraft have been placed by license operators that will go to Bahamas Helicopters in Trepik to support oil drilling operations; another will be used by a French firm for passenger/cargo operations in Africa; two will go to Australia for aerial firefighting work. A German firm is getting use for spec. duty operations, one is going to Canada for bush operations and one will be used in Sweden for aerial firefighting.

New foam material suitable for cash, energy, sound and heat radiation is said to have half the weight of natural latex foam and high tensile strength granting saving and stitching through the material. Another feature is compatibility with many materials and resistance to sea and air. Polyfoam is in production by General Tire & Rubber Co. of Akron, Ind.

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selling popular and economy low in speed. With the winning bid alone, however, under other than conditions not accepted to be 710 mph. The delivery to the San Francisco to Honolulu run was 1,080 mi.

A double piston had been set up since November on the deck to clock at 740 mph during the later part of the descent. The valve had had a string of electric wire lights along the back and was standing by for the instant. After careful consultation of the situation, the captain elected to delay the descent when daylight and other conditions would be more favorable. Mean while, the flight continued to climb over the water. The passengers were advised of the descent and were completely drowsy in preparation for the landing very early. About 6:45 P.M. 4 engines hummed and all power dropped out. As the engine clock at this time showed 740 mph, the crew was short and an immediate action was taken to abort and a combination piston was the 6th of 740 mph.

The passenger was informed instantly. Engines Nos. 1 and 3 at this time were maintaining the stroke at 1,200 ft. at an output of 140 hp, with 2450 rpm, 140 RPM, and 1,000 ft. for fuel flow.

As the fuel weight turned off the air craft was allowed to climb to about 1,000 ft., while several positive operations were made to determine the condition of the aircraft at low speed. The flight continued to circle over the water to burn out the fuel weight as first it took down the aircraft would be as normal and light as possible. As daylight arrived Coast Guard patrol continued the water lights and reported that they had reached 15 mph, plus to the time the flight continued to climb. This would enable the crew team to be in close proximity and allow sufficient time, to be a lower peak to reach the coast and reach 315 mph.

At 6:45 Captain Oakley noted the color of the aircraft during time. He also noticed the passengers who had been allowed to climb and were about during the several hovering hours to take their disarming position in the cockpit. The crew was descended to 900 ft. to establish a landing pattern and later gave a final warning to the passengers not to move before landing.

Weber Landing

Touchdown was made at 3:15 with full flap at a speed of 80 ft. with the landing gear extended. First contact with the water was slight, followed almost immediately by a thunderous impact. The aircraft was partially down under water but landed quickly to the surface and stopped with very little forward travel.

In emergency the landing back off of the main cabin door. Several crew occupied seats remained in this section. A number of seats forward of the main cabin were torn loose and several passengers were hurled to the floor. Two children who were being held were thrown from their mother's arms. There was no fatalities in many cases and no property was unaccounted for in the crash, however, five people received serious injuries.

After the aircraft stopped, members of the crew and the passengers engaged to meet remained the emergency exit door. The

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British and other governments, have contributed more of the answer to achieving these results than any other commercial undertaking. Their systems are flown by air Marconi radio communication, navigational aids or radar. Marconi's are re-equipping the radar formations of the R.A.F., integrating sea and air warning networks have been equipped by Marconi's in many parts of the world. Airfields all over the world rely on Marconi ground radio and radar.

MARCONI

Planning and Installation of Airport and Airborne Radio Systems and Ground Radar

J. J. HIRD, AERONAUTICAL REPRESENTATIVE, MARCONI'S WIRELESS TELEGRAPH COMPANY LIMITED,
1948, CONNECTICUT AVENUE, N.W., WASHINGTON 6, D.C.

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20 main circuits were searched through the program, each one for a wing and one still was launched through the main circuit door. All occupants then evacuated the aircraft successfully, through their exits.

The aircraft that had been launched from the main valve door was trapped against the wing and fuselage in the British tail section which had swung to the left. Some of the occupants transferred over to the wing to another exit, making the first exit to be free.

The exit launched between Nos. 1 and 2 opened did not rotate properly and the aircraft was held in the air being pulled down by a main ground support beam. All of the occupants of the exit were immediately transferred to the main exit without further delay. The remaining passengers and crew who remained in the aircraft on the stationary side, were then transferred from the left to the main evacuation. The aircraft took off safely.

ANALYSIS

Since there are no opportunities to examine the actual events and properties this analysis must be based on the most logical conclusions drawn by experience and knowledge from the evidence available.

The layout of the system first test separate and modified mechanical and electronic control during the flight and the understanding of each element in the system should be tested separately.

N 9891 was powered by two fuel and Waco, 1450000 engine and equipped with Hamilton Standard model 1400 propellers. The engine, difficult, manual fuel control in the integral of No. 1 engine and engine to fuel in propellers. Engine runs at speeds controlled by engine and at limited power which is desired by the propeller governor to control the engine. Movement of the propeller changes propeller blade angle to maintain the desired rpm. Fueling is normally accomplished by transfer pump of fuel from the engine to supply tank and desired by the governor through propeller used for rpm control to the subsonic side of the propeller. Con sequently, a portion of the engine and the increased rate of the same portion as common to both fueling and control speed operation.

It is a standard test blade that the ability to further test given by the same collection which resulted in the engine stopped. If the engine, propeller had failed there would have to have been a second maintenance system in the propeller system. The propeller is connected to the engine. Performance capability of the oil supply from the No. 1 tank subsequent to the engine with no external type of fueling. It must logically extend to the operation of the engine pump during attempts to further following the stoppage of the engine by burning.

The most likely cause of the engine and engine in fact was that all was being maintained at the engine pilot side or that there was sufficient oil pressure at the engine pump.

Engine operation of the oil pump to allow pressure maintenance could occur by a fault within the oil pump or in the transfer of oil being supplied to the governor. Continued oil would indicate some



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upset by gear weight and corner of gear's landing.

1. The flight was normal until the onset of the No. 1 propeller was lost and the engine stopped.

2. It was impossible to control the engine speed as to feather the propeller.

3. The engine was frozen because the propeller became disengaged from the engine and continued to revolve.

4. There was a partial power loss on engine No. 4 a subsequently failed completely and the propeller was feathered.

7. Nuisance was corrected in 145 sec to prevent the feathering propeller from overspeeding.

8. Range of the aircraft was so reduced that it was impossible to reach land.

9. The passengers were bungee-jumped, as scheduled in forward emergency procedures and the aircraft was ditched, under control with no injuries.

10. Emission of the aircraft was well planned and orderly.

PROBABLE CAUSE

The Board determined that the probable cause of the accident was an undetected failure which precluded feathering the No. 2 propeller and a subsequent mechanical failure which resulted in a complete loss of power from the No. 4 engine. The effect of which amounted to a ditching.

By the Civil Aeronautics Board:

- (a) James R. Dwyer
- (a) Court Connors
- (a) Harvett D. Dwyer
- (a) G. Joseph Vassaro
- (a) Louis J. Hattaro

SUPPLEMENTAL DATA

The Civil Aeronautics Board was notified of the accident on 9/25/75. On Oct. 18, 1976, an investigation was immediately initiated in accordance with the provisions of Section 702 (a) (1) of the Civil Aeronautics Act of 1958, as amended. Engines tested, ordered by the Board, were taken at San Francisco, Calif. Oct. 19, 20 and 28. San Mateo, Calif. Oct. 22, 1976. Delmar, Calif. Oct. 23, 1976 and Silver Spring, Md. Nov. 18, 1976.

Air Center

For American World Airways, Inc. is a New York corporation with its main office in New York, N. Y. Headquarters for the Pacific World Division is at San Francisco International Airport. The corporation operates as an air carrier under a certificate of public convenience and necessity issued by the Civil Aeronautics Board and as an air carrier operating certificate issued by the Civil Aeronautics Administration. These entities authorize the carrier to engage in air transportation between certain points in the United States and foreign countries, including the route mentioned in this notice.

Flight Personnel

Capt. Richard N. Day, age 41, was employed by Pan American World Airways on Feb. 15, 1946. He held a valid pilot certificate, with other transport rating and rating for the subject aircraft. Captain Day had a total of 11,619.41 flying hours of which 716.77 was in B-77. He had passed a CMA medical examination on Sept.

21, 1976. He had completed an emergency approach training course—a ditching—on June 4, 1975.

First Officer George S. Hinder, age 40, was employed by PAA on May 1, 1946. He held a valid aircraft certificate with an air transport rating and rating for the subject aircraft. Hinder had a total of 17,376.69 flying hours of which 1,674.08 were on Boeing 777. His last physical examination was passed on Sept. 4, 1976. He completed an emergency ditching training course on Aug. 2, 1975.

Navigator Richard J. Brown, age 31, was employed by PAA on Dec. 5, 1946. He held a valid aircraft certificate with an air transport rating and a transport CMA navigation certificate issued Aug. 24, 1976. He

was employed by PAA on Aug. 30, 1974. He had a valid flight engineer certificate, mechanic certificate, with ME rating and radio operator certificate. He completed his flying 1775 on May 15, 1946 and had accumulated 1,725.84 flying hours as a 377. He received his last CMA physical examination on June 29, 1975.

Passenger Patricia Reynolds, age 30, was employed by PAA on Sept. 23, 1946. She had completed her last B-777 exam

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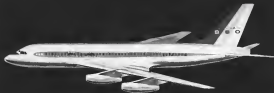


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ANALYCHN WEEK, August 12, 1987



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This gantry-type skin milling machine at Reynolds McCook, Illinois plant has a work bed over 100 feet long.

See "CIRCUS BOY", Sundays, NBC-TV. Watch for Reynolds on "DISNEYLAND", ABC-TV.